A TAXONOMIC REVIEW OF THE SPECIES OF *CINARA* CURTIS OCCURRING IN BRITAIN (HEMIPTERA : APHIDIDAE)

BY
VICTOR FRANK EASTOP

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Most of the introduced aphids are from central Europe and British material fits central European descriptions. There appears to be another fauna south of the Alps, as it is difficult to relate British material to the descriptions of the Italian fauna by Del Guercio (1909) and to the Spanish fauna by Gomez Menor (1962).

Recent accounts of the species of *Cinara* from various parts of Europe (Pašek, 1952–1954; Heinze, 1962; Szelegiewicz, 1962; Pintera, 1966) have made it much easier to identify the British species. Recent authors have made great use of the chaetotaxy of the processus terminalis of the last antennal segment and the shape of the first segment of the hind tarsus. As the last antennal segments and hind legs of trapped alatae of *Cinara* are often lost and as no previous account includes all the British species, this paper started as an attempt to construct a key to alatae using characters on less deciduous structures, such as the rostrum and abdomen.

The principal recent works on the taxonomy of *Cinara* include Braun, 1938 : 461–510, Börner, 1949 : 52–60, Heinze, 1962 : 145–178, Central Europe; Pašek, 1954 : 1–319 and Pintera, 1966 : 281–321, Czechoslovakia; Szelegiewicz, 1962 : 63–98, Poland; Shaposhnikov, 1964 : 521–524, European U.S.S.R.; Bodenheimer & Swirski, 1953 : 182–183, 245–246, Middle East; Narzikulov, 1962 : 111–118, Central Asia; Inouye, 1970 : 57–102, Japan; Paik, 1965 : 16–22, Korea; Takahashi, 1931 : 22–24, Taiwan; Blanchard, 1939 : 859–870, Argentina; Tissot, 1939 : 34–47, Florida; Palmer, 1952 : 20–52, Rocky Mountains. Hottes has published many papers on North American *Cinara* between 1930 and 1965. G. A. Bradley, 1956–1968, has published a series of papers on Canadian *Cinara* but his monograph has not yet appeared. Eastop, 1961 : 74–75 & 1966 : 525–529 gave keys to the species of *Cinara* introduced to Africa and Australia respectively.

NOMENCLATURE

There has been confusion about the use of *Lachnus* Burmeister and *Cinara* Curtis because both were described in 1835 and there was doubt about the identity of the type-species of both genera. As a result various replacement names were proposed but subsequently proved unnecessary. Hottes (1930 : 185–188) and Theobald (1929 : 352) discuss the usage of *Cinara* and *Lachnus*.

Although *Aphis pini* L. has been accepted as the type-species of *Cinara* for the last 40 years, there has been a dispute as to the species of *Cinara* to which the name *pini* L. should be applied. Stroyan (1955 : 332–333) summarizes the position.

GENERIC SYNONYMY

CINARA Curtis, 1835

[*Aphis* L., partim, auctores diversi, 1758–1852.]

[*Lachnus* Burmeister, partim, auctores diversi, 1835–1933.]

**Cinara* Curtis, 1835 : part 576. Type species: *Aphis pini* L., 1758 : 453.

**Lachniella* Del Guercio, 1909 : 286. Type-species: *Lachnus fasciatus* Burmeister, 1835 = *costata* Zetterstedt, 1828.

**Todolachnus* Matsumura, 1917 : 381. Type-species: *Todolachnus abietis* Matsumura, 1917 : 381–382.

Wilsonia Baker, 1919*a* : 212, nec Bonaparte, 1838. Type-species: *Lachniella gracilis* Wilson, 1919 : 20–21.

Dilachnus Baker, 1919*b* : 253, nec Fairmaire, 1896. Type-species: *Lachniella gracilis* Wilson, 1919 : 20–21.

Panimerus Laing in Theobald, 1929 : 129, nec Eaton, 1913. Type-species: *Lachniella gracilis* Wilson, 1919 : 20–21.

**Neochmosis* Laing in Theobald, 1929 : 129, footnote. Type-species: *Lachniella gracilis* Wilson, 1929 : 20–21.

Neodimosis Toth, 1935 : 495. [Incorrect subsequent spelling of *Neochmosis* Laing.]

**Cinaria* Börner, 1939 : 76. Type-species: *Aphis laricis* Walker.

**Cinarina* Börner, 1939 : 76. Type-species: *Lachnus viridescens* Cholodkovsky = *bogdanowi* Mordwilko.

**Cinaropsis* Börner, 1939 : 76. Type-species: *Lachnus pinicola* Kaltenbach, 1843, sensu Börner = *pilicornis* Hartig.

**Dinolachnus* Börner, 1940 : 1. Type-species: *Lachniella cilicica* var. *cecconii* Del Guercio = *abieticola* Cholodkovsky.

**Cupressobium* Börner, 1940 : 1. Type-species: *Aphis juniperi* De Geer.

**Cinarella* Hille Ris Lambers, 1948 : 275 [as subgenus of *Cinara* Curtis]. Type-species: *Lachnus pineus* Mordwilko.

**Subcinara* Börner, 1949 : 59 [as subgenus of *Cinara* Curtis]. Type-species: *Cinara brauni* Börner.

Cinarella Börner, 1949 : 59, nec Hille Ris Lambers, 1948 [as subgenus of *Cinara* Curtis]. Type-species: *Cinara laricicola* Börner, 1939 nec Matsumura, 1917 = *boerneri* Hille Ris Lambers.

**Laricaria* Börner, 1949 : 59 [as subgenus of *Cinaria* Börner]. Type-species: *Cinara kochiana* Börner.

Pityaria Börner, 1949 : 59 [as subgenus of *Cinaria* Börner]. Type-species: '*Lachnus pruinosus* Htg. = *bogdanowi* Md.'

**Mecinaria* Börner, 1949 : 59 [as subgenus of *Cinaria* Börner]. Type-species: *Aphis piceae* Panzer.

**Cinarellia* Börner, 1951 : ?; 1952 : 41. Type-species: *Cinara laricicola* Börner, 1939 (nec Matsumura, 1917) = *boerneri* Hille Ris Lambers. Börner, 1952 : 41 lists *Cinarellia* Börner, 1951 with *Cinarella* Börner, 1949 nec Hille Ris Lambers, 1948, as a synonym but gives no reference to the 1951 paper and I have not been able to find it.

**Buchneria* Börner, 1952 : 41, 242. Type-species: *Aphis pectinatae* Nördlinger.

[*Eulachnus* Del Guercio, Börner, 1952 : 241. Börner considered *Eulachnus mingazzinii* Del Guercio (= *piniphila* Ratzeburg) to be the type-species of *Eulachnus* Del Guercio. However, the International Commission on Zoological Nomenclature has since ruled that the type-species is *Lachnus agilis* Kaltenbach (*Bull. zool. Nom.* **22** : 188–189, 1965), and so *Eulachnus* is not a synonym of *Cinara* and is available in its most widely used sense with *Protolachnus* Theobald as a synonym.]

Neocinaria Pašek ms [as subgenus of *Cinaria* Börner]. Type-species: *Cinara escherichi* Börner [see Pintera, 1966 : 281–282].

Pseudocinara Pašek, ms [as subgenus of *Cinara* Curtis]. Type-species: *Lachnus neubergi* Arnhardt [see Pintera, 1966 : 282].

The names marked with an asterisk (*) are available for subgenera.

Alphabetical list of the type-species of the subgenera and synonyms of *Cinara*.

abieticola Cholodkovsky, 1899. Type of *Dinolachnus* Börner, 1940 (as *cilicica* var. *cecconii*).

abietis Matsumura, 1917. Type of *Todolachnus* Matsumura, 1917.

boerneri Hille Ris Lambers, 1956. Type of *Cinarella* Börner, 1949 (nec *Cinarella* Hille Ris Lambers, 1948) and *Cinarellia* Börner, 1951/1952, as *laricicola* Börner, 1939 nec Matsumura, 1917.

bogdanowi Mordwilko, 1895. Type of *Cinarina* Börner, 1939 (as *viridescens*) and *Pityaria* Börner, 1949 (as *pruinosus*).
brauni Börner, 1940. Type of *Subcinara* Börner, 1949.
cilicica var. *cecconii* Del Guercio = *abieticola* Cholodkovsky.
costata Zetterstedt, 1828. Type of *Lachniella* Del Guercio, 1909 (as *fasciata*).
escherichi Börner, 1950. Type of *Neocinara* Pašek, m.s.
fasciata Burmeister, sensu Del Guercio, 1909 = *costata* Zetterstedt.
gracilis Wilson, 1919. Type of *Wilsonia* Baker, 1919 (nec *Wilsonia* Bonaparte, 1838 etc.); *Dilachnus* Baker, 1919 (nec Fairmaire, 1896); *Panimerus* Laing, 1929 (nec Eaton, 1913) and *Neochmosis* Laing, 1929.
juniperi De Geer, 1773. Type of *Cupressobium* Börner, 1940.
kochiana Börner, 1939. Type of *Laricaria* Börner, 1949.
laricicola Börner, 1939 nec Matsumura, 1917 = *boerneri* Hille Ris Lambers.
laricis Walker, 1848. Type of *Cinaria* Börner, 1939.
neubergi Arnhardt, 1930. Type of *Pseudocinara* Pašek, m.s.
pectinatae Nördlinger, 1880. Type of *Buchneria* Börner, 1952.
piceae Panzer, 1801. Type of *Mecinaria* Börner, 1949.
pilicornis Hartig, 1841. Type of *Cinaropsis* Börner, 1939 (as *pinicola*).
pineus Mordwilko, 1895. Type of *Cinarella* Hille Ris Lambers, 1948.
pini L., 1758. Type of *Cinara* Curtis, 1835.
pinicola Kaltenbach, 1843 sensu Börner = *pilicornis* Hartig.
pruinosus Hartig, 1841 sensu Börner = *bogdanowi* Mordwilko.
viridescens Cholodkovsky, 1898 = *bogdanowi* Mordwilko.

SYSTEMATICS

The European species of *Cinara* fall into fairly well defined groups which have been dignified as genera and subgenera. The British species could be arranged as in the table on page 175. Although there are evident groups of species when the world fauna is considered, I have not been able to find characters to separate them absolutely. For instance, *Cinara konoi* Inouye, *C. longipennis* (Matsumura) and *C. todocolus* Inouye from the Far East, *C. chinookiana* Hottes, *C. lasiocarpae* (Gillette & Palmer) and *C. sonata* Hottes from America all resemble *C. abieticola* (Cholodkovsky) and live on *Abies*, suggesting that *Dinolachnus* should be regarded as at least subgenerically distinct. *Cinara sonata*, however, has four sub-apical setae on the processus terminalis and a rim around the primary rhinaria, just the characters distinguishing *Cinara* s. str. from the other *Dinolachnus*. *Cinara* (*Lachniella*) *costata* (Zetterstedt) from *Picea* in the palaearctic region has characteristically pigmented wings and short first tarsal segments, as does *C.* (*L.*) *comata* Doncaster from the Himalayas. The dorsal length of the first tarsal segments of their hind legs is only about 0·6–0·8 of the basal diameter, and about 0·25–0·33 of the ventral length of the segment. In *C.* (*L.*) *nimbata* Hottes from *Picea engelmanii* in North America the dorsal length of the first tarsal segments of the hind leg is about 1·2–1·5 times as long as its basal diameter and about 0·4 of its ventral length. Apart from bearing rather shorter hairs, *C.* (*L.*) *nimbata* is otherwise similar to *C.* (*L.*) *costata*. *Cinara difficilis* Hottes from *Juniperus* in North America has short

first tarsal segments and long fine hairs like a *Cupressobium*, but has a a rim round the primary rhinaria and bears five sub-apical setae on the processus terminalis. *C. manitobensis* Bradley from *Juniperus* in North America has four sub-apical setae on the processus terminalis, a rim round the primary rhinarium and the appearance of a *Cinaropsis*. *Cinara coloradensis* (Gillette) and *C. hottesi* Gillette & Palmer live on *Picea* in North America but resemble the *C. pini* group (= *Cinara* s. str.) which are confined to *Larix* and *Pinus* in Europe. I have not been able to find any satisfactory subgeneric separation for the world fauna.

Heie (1967 & 1969) gives a comprehensive account of the aphids known from baltic amber, which is thought to be the petrified resin of *Pinites succinifera* Goeppert, an extinct conifer related to *Pinus*. Heie studied 103 aphids from amber without finding a single member of the subfamily Lachninae to which *Cinara* belongs. *Pinites* resin may have been more sticky in the rather warmer conditions of the lower Oligocene than *Pinus* resin is today. The absence of *Cinara* from present-day resin on English conifers may be due to resin being most sticky in high summer when *Cinara* are little evident, being either subterranean or perhaps in reproductive diapause. I have not been able to find insects trapped in resin on living conifers in order to compare them with the aphid fauna of the tree. Under English conditions, conifer resin usually occurs only in small quantities, and the surface is not sticky. The large size, complete wing venation, dense pubescence, trace of a third tarsal segment, distinct 4th and 5th rostral segments, compound eyes in all forms, absence of host-plant alternation and association with coniferae are characters suggesting that *Cinara* belongs to an old group of aphids. The absence of Lachninae from baltic amber, however, and the short straight radius arising from near the tip of the stigma of the fore wing suggest that the group is more recent.

GENERIC DIAGNOSIS

Medium-sized to large aphids, body 2–8 mm long. General appearance as in Text-fig. 28 (p. 154). Yellowish, red-brown, dark brown or sometimes green aphids. Antennal tubercles absent. Antennae 6-segmented, 0·2–0·6 as long as the body. Processus terminalis short, 0·08–0·33 as long as the base of the sixth antennal segment and bearing 3 apical and 2–11 sub-apical setae. Apterae usually with a rhinarium at the apex of the fourth antennal segment and often also with a secondary rhinarium on the fifth segment just basad of the primary rhinarium. Alatae viviparae with secondary rhinaria distributed: III, 1–18; IV, 0–6; V, 0–4; VI, 0. Antennae, body and legs often covered with numerous long fine hairs (Text-figs 1, 19, 28–31, 38–39) or the hairs may be shorter and only about equal in length to the diameter of the third antennal segment (Text-figs 6, 18, 22). Rostrum evidently consisting of five segments, the suture between segments 4 and 5 distinct (Text-figs 4, 9, 10, 25, 36). The fourth rostral segment bears from 2 to 60 accessory hairs but most species bear 4–14 accessory hairs arranged in two rows bordering the groove for the stylets. Wing venation as in Text-figs 13, 20, 37; the radius originates from the end of the pterostigma and extends in a straight line to the wing apex. Hind wing with two oblique veins. Tarsi 2-segmented but when the basal segment is long as in the subgenus *Cinarella*, it often bears traces of a suture suggest-

ing that it is composed of two fused segments. The first tarsal segment bears nine or more ventral hairs and the second segment bears eight or more long dorsal hairs and about 16 shorter ventral hairs. Empodial hairs very short, only about 0·1 times as long as the claws. Mid thoracic furca of apterae with a short base.

Siphunculi placed on pigmented cones whose diameter varies with the degree of pigmentation but is often about equal to the length of the third antennal segment. Cauda crescent-shaped and bearing about 20 hairs. Eighth abdominal tergite bearing 7–77 hairs.

TAXONOMY

The ratios of the fifth antennal segment to the other antennal segments have been used to recognize species. The fifth antennal segment tends to increase in size more with increased body size than does the sixth antennal segment. Thus the antennal V : VI ratio tends to increase with body size and the differences between large and small specimens are greatest in species with the greatest differences between the lengths of the segments. In *Cinara laricis* and *C. piceae* with a relatively long antennal V, the V : VI ratio of large specimens varies from 1·9–2·4 and for *C. abieticola* from 1·9–2·2, while the ratio varies from 1·2–1·5 in small specimens of all three species. In species where antennal VI is as long as or longer than V (*Cupressobium, Lachniella, Buchneria*), V and VI increase in length more or less in unison and in proportion to the body length. These species have an antennal V : VI ratio of 0·7–1·1 over their whole size range. In species with antennal V only a little longer than VI, such as *C. pini, C. bogdanowi, C. pilicornis* (i.e. ± *Cinara* s. str. and *Cinaropsis*), the large specimens have the antennal V : VI ratio varying from 1·3–1·8 and the small specimens from 1·0–1·4.

The adults, particularly of fundatrices and oviparae, may look similar to fourth instar larvae. The adult form can be recognized by the shape of the sub-genital plate. The rudimentary gonopophyses are also a sign of maturity but are sometimes difficult to detect in adults and may sometimes be detected before the final moult.

Fundatrices usually have shorter antennae and legs than the later generations and the processus terminalis is particularly short. The fundatrices often bear more abdominal hairs than later generations but sometimes bear fewer hairs on the second and sixth antennal segments than later generations. *Cinara piceae* is unusual in that the fundatrices tend to bear fewer abdominal hairs as well as fewer hairs on the fourth rostral segment and second antennal segment than in the summer generations. *Cinara piceae* is also unusual in that while oviparae are common, males are unknown. The fundatrices of *C. piceae* may arise from unfertilized eggs or be fundatrices spuriae derived from an as yet undetected overwintering larva. The apterous summer generations of some species bear a well developed mesosternal tubercle (Text-fig. 11, p. 127) but the tubercle is absent or only weakly developed in the spring generations of these species.

The eighth abdominal tergite of the oviparae may be pale but in *Cinara boerneri* it bears a small amount of pigmentation similar to the apterae viviparae. In the viviparae of most species of *Cinara* the eighth abdominal tergite is well pigmented. The sub-genital plate of the oviparae is large and densely hairy and there is often

a group of latero-ventral hairs on either side of the eighth abdominal tergite. The hind tibiae of the oviparae are slightly thickened and bear numerous pseudosensoria in the species with alate males. The hind tibiae of the oviparae of *C. acutirostris*, which has apterous males, are devoid of pseudosensoria Samples of oviparae of *C. boerneri* collected together with males show evident pseudosensoria but in one sample in which only oviparae were collected the pseudosensoria are indistinct. In oviparae of *C. kochiana* the pseudosensoria are present but indistinct even when males are present.

The male genitalia of *Cinara boerneri* (Text-figs 14–16), *C. cupressi* (Text-fig. 21) and of *C. pectinatae* (Text-fig. 26) may be characteristic for each species. The problem when using male genitalia for aphid taxonomy is that, being soft, preparations from the same sample (Text-figs 14–16) may look different merely through lying in different positions.

Descriptions of each species are not given individually but biometric data for apterae and alatae viviparae and discriminants for apterae and alatae viviparae are given in the tables between pages 172–173. Data for sexuales are given in the table on page 175.

BIOLOGY

As far as is known *Cinara* species live only on Coniferae and usually only on Pinaceae and Cupressaceae. Most of the species living on Pinaceae are specific to one or to a few closely related species of *Abies*, *Larix*, *Picea* or *Pinus*. No species are known which live on more than one of these genera although some species normally living on *Abies* can breed successfully on *Cedrus*. Some *Cinara* living on Cupressaceae have a wider host-plant range, occurring on species in several genera of conifers although often not on all the species in these genera. For instance the usual hosts of *Cinara cupressi* are *Cupressus macrocarpus*, *Thuja occidentalis* and *Juniperus virginiana*. This host-plant range may only be a reflection of the lower level of agreement among botanists of the generic classification of Cupressaceae compared with the Pinaceae. *Cinara* species feed on the bark of their host-plants and some species are associated with lesions of Pine rust fungi (Tissot & Pepper, 1967 : 1–10). This association with rust fungi may be analogous with the habit of feeding on other insects galls found in other aphids in various systematic groups. The presence of the fungi may act as a physiological sink and like galls, stimulate the translocation of the metabolic products on which the aphids feed.

Most species of *Cinara* overwinter in the egg-stage from which an apterous fundatrix develops in the spring. The second or third generation is commonly winged and the summer may be spent on the roots of the same species of conifer on which the overwintering egg was laid. The remaining generations may be wingless or some alatae may occur from July onwards. In the autumn oviparae and winged or sometimes wingless males are produced. *Cinara piceae* is a widely distributed species in which oviparae have often been found but males are unknown. Some species of *Cinara* continue to reproduce on the aerial parts of their host all through the summer. Others remain on the aerial parts but adult apterae collected in late July or August may not contain fully developed embryos, which suggests

that reproductive diapause occurs. Many species of *Cinara* are associated with ants (Way, 1963 : 307–344). Several species of *Cinara* are of importance to bee-keepers in Central Europe as their honeydew is the source of 'forest honey'.

KEY TO THE APTERAE VIVIPARAE OF THE BRITISH SPECIES OF *Cinara*

1 Fourth rostral segment (Text-fig. 25) 330–420μ long, 2·4–3·0 times as long as the fifth rostral segment and bearing 24–32 accessory hairs arranged in 4 longitudinal rows of 6–8 hairs per row. Second antennal segment bearing 21–31 hairs. Base of sixth antennal segment (Text-fig. 23) bearing 15–24 hairs. Processus terminalis (Text-fig. 24) bearing 6–9 sub-apical setae. Mesosternal tubercle moderately developed. Second segment of hind tarsus 1·0–1·2 times as long as the fourth rostral segment. Fifth abdominal tergite bearing 18–30 hairs between the siphunculi. Longest hairs on the third abdominal tergite 15–25μ long. On *Larix* . . . . . ***kochiana*** (p. 143)

– Fourth rostral segment 120–370μ long, 1·5–3·0 times as long as the fifth rostral segment and bearing 2–17 accessory hairs arranged in two longitudinal rows of 1–9 hairs per row. (Text-figs 4, 9, 10). Second antennal segment bearing 5–26 hairs. Base of the sixth antennal segment bearing 4–20 hairs and processus terminalis usually with only 3 or 4 sub-apical setae but sometimes with 5–11. If either the second antennal segment bears 20 or more hairs on the base of the sixth antennal segment bears 19 or more hairs (*abieticola*, *bogdanowi*, *stroyani*), then the fifth abdominal tergite bears 40–95 hairs between the siphunculi and the longest hairs on the third abdominal tergite are 60–270μ long. If the processus terminalia bears 5–11 subapical setae, then either the mesosternal tubercle is absent and the second antennal segment, base of the sixth antennal segment, fourth rostral segment, fifth abdominal segment between the siphunculi and the eighth abdominal tergite each bear only 5–17 hairs (*piceae*, *escherichi*) or if the fifth abdominal tergite bears 23–36 hairs between the siphunculi (*brauni*), then abdominal tergites 5–7 are fused in a solid dark patch 2

2 (1) Abdominal tergites 5–7 bearing a solid dark patch encompassing the siphuncular cones.

Processus terminalis 50–100μ long, 22–33% of the total length of the sixth antennal segment and bearing 5–7 sub-apical setae. Second segment of the hind tarsus 360–4430μ long, 1·1–1·5 times as long as the fourth rostral segment which is 250–320μ long. Eighth abdominal tergite bearing only 10–15 hairs, the longest of which are 140–180μ long. Longest hair on the third abdominal tergite 140–190μ long. Third antennal segment (Text-fig. 19) 500–700μ long and 4·5–9·5 times as long as the longest hair, 70–120μ, borne on it. On *Pinus nigra*. . . . . ***brauni*** (p. 133)

– Pigmentation absent from tergites 5 and 6 or present only as isolated scleroites, any pigmentation present on each tergite being distinct from that on the other tergites.

Processus terminalis usually bearing only 3 or 4 sub-apical setae but if with 5–11 then the longest hair on the third abdominal tergite is 5–30μ long 3

3 (2) Some at least of the hairs on the anterior abdominal tergites arising from scleroites with a diameter several times that of the hair base.

Medium to large aphids, body 2·5–5·2 mm long, hind tibiae 1·5–3·5 mm long. Second antennal segment bearing only 5–10 hairs, base of the sixth antennal segment bearing 2–8 hairs. Fourth rostral segment bearing 4–8 accessory hairs. First segment of hind tarsus 2·9–5·7 times as long as its own basal width. Third, fourth and fifth antennal segments often without secondary rhinaria. On *Abies*, *Larix* and *Pinus* 4

– Scleroites absent or if present their diameter is less than 2·5 times that of the hair base 7

4 (3) Mesosternal tubercle (Text-fig. 11) present in the summer generations but sometimes only weakly developed or absent in the spring generations. Sixth antennal segment 100–160+ 22–37μ long. Ultimate rostral segment 150–210+ 80–100μ long. Second segment of hind tarsus 270–390μ long, 2·0–2·5 times as long as the first segment of the hind tarsus which is 110–180μ long and is 2·9–4·1 times as long as its own basal diameter. Fourth antennal segment often and fifth antennal segment usually bearing a secondary rhinarium. On *Larix* and *Pinus* 5

– Mesosternal tubercle absent. Sixth antennal segment 140–230+ 42–71μ long. Ultimate rostral segment 210–290+ 110–170μ long. Second segment of hind tarsus 350–530μ long, 1·4–2·0 times as long as the first segment of the hind tarsus which is 190–330μ long and 3·7–5·7 times as long as its own basal diameter. Third and fourth antennal segments usually and fifth often without secondary rhinaria. On *Abies and Pinus* 6

5 (4) Third antennal segment 6·5–13 times as long as the longest hair, 40–80μ, borne on it. Hind tibiae 1·5–2·9 mm long, 17–34 times as long as the longest hairs, 65–125μ borne on them. Fourth rostral segment 160–210μ long. Third antennal segment usually without a rhinarium, fourth antennal segment often without a rhinarium. Base of the sixth antennal segment bearing 4–7 hairs. Fifth abdominal tergite bearing 20–42 hairs between the siphunculi. Eighth abdominal tergite bearing 13–23 hairs. On *Larix*.
laricis (p. 146)

– Third antennal segment 4·3–6·0 times as long as the longest hair, 110–150μ, borne on it. Hind tibiae 2·5–2·7 mm long, 14–16 times as long as the longest hairs, 170–190μ borne on them. Fourth rostral segment 150–160μ long. Third and fourth antennal segments each usually bearing a rhinarium. Base of the sixth antennal segment bearing 8–10 hairs. Fifth abdominal tergite bearing 40–50 hairs between the siphunculi. Eighth abdominal tergite bearing 20–24 hairs. On *Pinus sylvestris* . . ***pinihabitans*** (p. 162)

6 (4) Siphuncular cones (Text-fig. 33) 250–700μ in diameter. Third antennal segment 490–740μ long and 3·0–6·5 times as long as the longest hair, 90–210μ, borne on it. Fourth rostral segment 210–290μ long, 1·6–2·2 times as long as the fifth rostral segment, which is 110–170μ long. Hind tibia 1·8–3·4 mm long and 12–20 times as long as the longest hair, 120–230μ, borne on it. Longest hair on the third abdominal tergite 95–210μ, on the eighth abdominal tergite 130–200μ long. Eighth abdominal tergite bearing 23–28 hairs. Green aphid with paired dorsal longitudinal yellow stripes. On *Abies*.
pectinatae (p. 148)

– Siphuncular cones (Text-fig. 33) 250–700μ in diameter. Third antennal segment 490–740μ long and 3·0–6·5 times as long as the longest hair, 90–210μ, borne on it. Fourth rostral segment 210–290μ long, 1·6–2·2 times as long as the fifth rostral segment, which is 110–170μ long. Hind tibia 1·8–3·4 mm long and 12–20 times as long as the longest hair, 120–230μ, borne on it. Longest hair on the third abdominal tergite 95–210μ, on the eighth abdominal tergite 120–230μ long. Eighth abdominal tergite bearing 13–26 hairs. Yellowish brown aphids bearing numerous darker brown spots. On *Pinus*.
pinea (p. 156)

7 (3) Eighth abdominal tergite bearing 7–18 hairs. Fourth rostral segment 300–370μ long. Fifth abdominal tergite bearing 6–17 hairs between the siphunculi. Longest hairs on the third abdominal tergite 5–26μ and on the eighth abdominal tergite 45–130μ. Processus terminalis bearing 6–11 sub-apical setae.

Body length 3·2–6·7 mm. Hind tibiae 2·4–5·2 mm long and 36–84 times as long as the longest hair, 50–90μ, borne on them. Sub-genital plate bearing 40–80 hairs. On *Picea* . . . . . ***piceae*** (p. 150)

– Eighth abdominal tergite bearing 7–77 hairs but if with less than 19 (*acutirostris*, *boerneri*, *cupressi*, *stroyani*, *pini*, *escherichi*, *fresai*) then the fourth rostral segment is 130–280μ long, and if more than 250μ long (*stroyani*) then the fifth abdominal tergite bears 40–90 hairs between the siphunculi and the longest hair on the third abdominal tergite is 60–150μ long . . . 8

8 (7) Fifth abdominal tergite bearing only 3–8 hairs between the siphunculi. Mesosternal tubercle well developed.

Longest hair on the third abdominal tergite 12–60μ long. Third antennal segment 400–700μ long, 6·5–15 times as long as the longest hair, 25–95μ, borne on it. Base of the sixth antennal segment 100–180μ long and bearing 8–16 hairs. Second antennal segment bearing 5–13 hairs. Eighth abdominal tergite bearing 7–23 hairs. Second segment of hind tarsus 210–320μ long, 2·0–2·6 times as long as the first segment of the hind tarsus, which is 90–150μ long, and 2·7–3·6 times as long as its own basal diameter. Second segment of hind tarsus 1·1–1·7 times as long as the fourth rostral segment, which is 140–250μ long and bears 6–10 accessory hairs. Hind tibia 1·5–3·3 mm long and 23–44 times as long as the longest hair, 40–120μ, borne on it. On *Pinus* 9

– Fifth abdominal tergite bearing 16–95 hairs between the siphunculi.

Mesosternal tubercle absent 11

9 (8) Processus terminalis bearing 5–7 sub-apical setae. Second antennal segment bearing 9–13 hairs. Eighth abdominal tergite bearing 14–23 hairs, the longest of which are 90–120μ long. Hairs on the third abdominal tergite 12–20μ long. Body 3·4–4·3 mm long. Hind tibiae 2·6–3·3 mm long. Third antennal segment 9·5–15 times as long as the longest hair borne on it, which is 40–70μ long.

Fourth rostral segment 210–230μ long, 2·0–2·4 times as long as the fifth rostral segment and bearing 8–11 accessory hairs. On *Pinus sylvestris*.

escherichi (p. 139)

– Processus terminalis bearing only 4 sub-apical setae. Second antennal segment bearing 5–10 hairs. Eighth abdominal tergite bearing 7–18 hairs. Longest hair on third abdominal tergite 15–33 or 45–60μ long. Either smaller, body 2·5–3·4 mm long, hind tibiae 1·6–2·5 mm long and bearing hairs 40–95μ long, third antennal segment 7·7–15 times as long as the longest hair, 25–80μ, borne on it, or body 3·5–4·1 mm long, hind tibia 2·7–3·2 mm long and bearing hairs 90–120μ long, and third antennal segment 6·5–9·5 times as long as the longest hair, 70–95μ long, borne on it 10

10 (9) Body 3·5–4·1 mm long. Hind tibia 2·7–3·2 mm long. Longest hair on third abdominal tergite 45–65μ long. Third antennal segment (Text-fig. 6) 550–650μ long, 6·5–9·5 times as long as the longest hair borne on it. Fourth rostral segment 210–250μ long (Text-figs 9 and 10). On *Pinus nigra*.

acutirostris (p. 128)

– Body 2·5–3·4 mm long. Hind tibiae 1·6–2·5 mm long. Longest hair on third abdominal tergite 15–35μ long. Third antennal segment 400–600μ long and 7·5–15 times as long as the longest hair, 25–80μ, borne on it. Fourth rostral segment 140–220μ long. On *Pinus sylvestris* . . . . ***pini*** (p. 160)

11 (8) Third abdominal tergite bearing hairs up to 12–35μ long. Processus terminalis 14–25% of the total length of the sixth antennal segment. Fourth rostral segment 150–210μ long. Hind tibiae 2–3 mm long and 30–35 times as long as the longest hair, 50–70μ, borne on them. Second segment of hind tarsus 360–460μ long, 2·1–2·7 times as long as the first segment of the hind

tarsus, which is 150–200μ long. Fifth abdominal tergite bearing 16–36 hairs between the siphunculi (Text-fig. 17). Primary rhinaria without chitinised rims. Third antennal segment (Text-fig. 18) without rhinaria. Hairs on the third antennal segment 20–70μ long and on the eighth abdominal tergite 60–100μ long. On *Larix* . . . ***boerneri*** (p. 129)

– Hairs on third abdominal tergite up to 45–270μ long, if less than 60μ then the processus terminalis is about 25% of the total length of the sixth antennal segment, the fourth rostral segment is 290–330μ long, the hind tibiae are 2–3 mm long and 15–30 times as long as the longest hair, 110–150μ, borne on them (*schimitscheki*). If the longest hair on the third abdominal tergite is 60–80μ long, then either *schimitscheki* as previously or *stroyani*, in which case the fifth abdominal tergite bears 40–90 hairs between the siphunculi, the primary rhinaria have chitinized rims, the fourth rostral segment is 210–280μ long, the third antennal segment usually bears a rhinarium and bears hairs up to 55–136μ long and the eighth abdominal tergite bears hairs up to 85–160μ long. On *Pinus nigra*, *Abies*, *Picea*, *Cedrus* and Cupressaceae . 12

12 (11) Body 4·6–8 mm long. Hind tibiae 3·3–5·5 mm long and 12–20 (rarely to 30) times as long as the longest hair, rarely 150–180μ but usually 260–330μ, borne on them. Third antennal segment (Text-fig. 1) 0·75–1·1 mm long and 2·5–4·5 times as long as the longest hair, 190–300μ borne on it. Base of the sixth antennal segment (Text-fig. 2) 230–290μ long and bearing 9–14 hairs. Processus terminalis (Text-fig. 3) 44–90μ long and bearing 3 or 4 sub-apical setae. Fourth rostral segment (Text-fig. 4) 270–350μ long, 2·1–2·6 times as long as the fifth rostral segment (120–150μ), and bearing 7–13 accessory hairs. Second segment of hind tarsus (Text-fig. 5) 380–500μ long and 2·5–3 times as long as the first segment of the hind tarsus, which is 130–180μ long. Third antennal segment without but fourth segment with 1–4 rhinaria. Primary rhinarium of the fifth antennal segment without a chitinized rim. Fifth abdominal tergite bearing 70–90 hairs between the siphunculi, eighth abdominal tergite bearing 25–45 hairs up to 190–360μ long. Siphuncular cones 460–990μ in diameter. On *Abies* spp. and sometimes *Cedrus* . . . . . ***abieticola*** (p. 123)

– Body 1·7–5·0 mm long. Hind tibiae 0·9–3·0 mm long. Third antennal segment 250–950μ long. Base of the sixth antennal segment 110–230μ long. If body more than 4·5 mm long (*bogdanovi*, *pilicornis*, *schimitscheki* and fundatrices of *stroyani*) then the second segment of the hind tarsus is 1·6–2·5 times as long as the first segment of the hind tarsus (*bogdanovi* & *schimitscheki*) or 3·0–4·1 times as long as the first segment of the hind tarsus (*pilicornis*) or 2·6–3·1 times as long as the first segment of the hind tarsus but in this case the siphuncular cones are 210–370μ in diameter, the third antennal segment is only 440–520μ long and is 4·5–7 times as long as the longest hair, 70–100μ, borne on it, the base of the sixth antennal segment is only 130–150μ long, the processus terminalis is only 19–32μ long, the fourth rostral segment is only 220–250μ long, the fifth rostral segment is 90–110μ long, the hind tibiae are only 1·7–2·1 mm long and bear hairs up to 100–125μ long and the longest hair on the third abdominal tergite is 80–110μ long and on the eighth abdominal tergite is 125–155μ long. On *Pinus nigra*, *Picea* spp. and Cupressaceae . 13

13 (12) Second segment of hind tarsus 320–380μ long and 1·6–1·9 times as long as the first tarsal segment which is 170–220μ long and 3·5–4·1 times as long as its own basal diameter. Second segment of hind tarsus 0·9–1·2 times as long as the fourth rostral segment (Text-fig. 36) which is 290–340μ long and bears 6 accessory hairs. Second antennal segment bearing 9–13 hairs and base of the sixth antennal segment bearing 6–9 hairs.

Body 3·2–5·2 mm long and densely covered with small dark scleroites

(Text-fig. 35) with a diameter only a little greater than the hair bases they encircle. Third antennal segment 600–800μ long and 5·5–12 times as long as the longest hair, 70–120μ, borne on it. Hind tibiae 2–3 mm long and 15–30 times as long as the longest hairs, 110–150μ, borne on them. Longest hairs on the third abdominal tergite 45–100μ. Fifth abdominal tergite (Text-fig. 34) bearing 25–60 hairs between the siphunculi, eighth abdominal tergite bearing 25–65 hairs up to 95–130μ long. Third and fourth antennal segments without rhinaria. Processus terminalis 55–70μ long and about 25% of the total length, 210–270μ, of the sixth antennal segment. On *Pinus nigra* . . . . . ***schimitscheki*** (p. 164)

– Second segment of hind tarsus 200–520μ long and 1·9–4·1 times as long as the first segment of the hind tarsus, which is 60–80μ long and 1·5–3·8 times as long as its own basal diameter. If the fourth rostral segment is more than 280μ long (*bogdanovi*) then it bears 9–13 accessory hairs and the second antennal segment and the base of the sixth antennal segment each bear 11–26 hairs. On *Picea* spp. and Cupressaceae 14

14 (13) Hind tibiae 1·3–2·7 mm long and 13–29 times as long as the longest hair, 70–165μ, borne on it. Third antennal segment 340–740μ long and 3·2–7·5 times as long as the longest hair, 55–145μ, borne on it. Fourth rostral segment 210–320μ long and bearing 6–13 accessory hairs. Primary rhinaria with a chitinised rim. On *Picea* 15

– Hind tibiae 0·9–2·2 mm long and 4–12 times as long as the longest hair, 140–280μ, borne on it. Third antennal segment 240–580μ long and 1·5–4·5 times as long as the longest hairs borne on it, which are sometimes only 80–100μ but are usually 100–250μ long; the ratio is more than 2·9 only in *pilicornis*. Fourth rostral segment 120–250μ long and bearing 2–8 accessory hairs. On *Picea* spp. and Cupressaceae 16

15 (14) Sub-genital plate bearing 18–33 hairs mostly placed laterally. Third antennal segment often without rhinaria but sometimes 1 or 2 are present. Second segment of hind tarsus 250–380μ long and 0·9–1·4 times as long as the fourth rostral segment, 240–320μ, which bears 9–13 accessory hairs ***bogdanovi*** (p. 132)

– Sub-genital plate bearing 33–65 hairs. Third antennal segment usually bearing 1–3 rhinaria but sometimes these are absent. Second segment of hind tarsus 310–470μ long and 1·2–1·9 times as long as the fourth rostral segment, which is 210–280μ long and bears 6–9 accessory hairs . ***stroyani*** (p. 165)

16 (14) Primary rhinaria with chitinized rims. Processus terminalis usually bearing 4 but sometimes only 3 sub-apical setae. Eighth abdominal tergite bearing 20–77 hairs up to 120–200μ long. Third antennal segment 250–530μ long, 2·0–4·5 times as long as the longest hair, 80–170μ, borne on it. On *Picea* . 17

– Primary rhinaria without chitinized rims. Processus terminalis usually bearing only 3 but sometimes 2 or 4, sub-apical setae. Eighth abdominal tergite bearing 16–31 hairs up to 120–260μ long. Third antennal segment 190–500μ long, 1·5–2·5 times as long as the longest hair, 110–250μ, borne on it. On Cupressaceae 18

17 (16) Second segment of hind tarsus 250–330μ long and 0·6–1·0 as long as the diameter of the siphuncular cones, 330–530μ. Third antennal segment 280–450μ long, 0·8–1·2 times as long as the diameter of the siphuncular cones and 2·0–2·8 times as long as the longest hairs, 140–170μ, borne on the third antennal segment . . . . . ***costata*** (p. 134)

– Second segment of hind tarsus (Text-fig. 29) 300–520μ long, 1·2–2·5 times as long as the siphuncular diameter of 130–390μ. Third antennal segment (Text-fig. 30) 250–530μ long, 1·2–2·2 times as long as the siphuncular diameter and 2·3–4·5 times as long as the longest hairs, 80–150μ, borne on the third antennal segment . . . . . ***pilicornis*** (p. 152)

18 (16) Hind tibiae dark only at the apex, the proximal three quarters pale. Processus terminalis 11–20% (exceptionally to 28%) of the total length of the sixth antennal segment. Base of the sixth antennal segment 110–170μ long and bearing 8–14 hairs extending over most of its length.

Longest hairs on the third antennal segment 110–170μ long, on third abdominal tergite 100–180μ and on the eighth abdominal tergite 120–190μ long. Second segment of hind tarsus 200–280μ long and 1·4–1·7 times as long as the fourth rostral segment, which is 140–180μ long and bears 5–8 accessory hairs. Yellow-brown or sometimes darker aphids, on the undersides of the branches, often near the trunk of *Callitris*, *Chamaecyparis*, *Libocedrus* and *Thuja orientalis* . . . . . ***tujafilina*** (p. 166)

– Hind tibiae dark at both base and apex at least. Base of the sixth antennal segment 130–230μ long and 2·5–5 times as long as the processus terminalis 19

19 (18) Hind tibiae completely black or dark brown. Third antennal segment 240–410μ long, 0·5–1·1 (but rarely exceeding 0·9) times as long as the diameter of the siphuncular cone, 270–590μ.

Third antennal segment usually shorter than the fourth and fifth segments together. Fourth rostral segment 120–170μ long and bearing 3–5 accessory hairs. Processus terminalis 40–70μ long, base of the sixth antennal segment 150–230μ long and bearing 3–5 accessory hairs. Sub-genital plate bearing 19–27 hairs. Second segment of hind tarsus 250–350μ long, 3·1–4·0 times as long as the first segment of the hind tarsus, 70–100μ, and 1·8–2·4 times as long as the fourth rostral segment, which is 1·4–2·1 times as long as the first segment of the hind tarsus. On *Juniperus communis* . ***juniperi*** (p. 141)

– Hind tibiae with a paler area from about the basal one-fifth to half its length. Third antennal segment usually longer, ratio 0·7–1·7, than the diameter of the siphuncular cone. On *Cupressus* spp., *Thuja occidentalis* and *Juniperus* spp., other than *communis* 20

20 (19) Base of the sixth antennal segment 130–160μ long and bearing 4–7 (usually 5 or 6) hairs, which are confined to the basal half. Fourth rostral segment 120–170μ long, bearing 2–4 accessory hairs, and 1·4–1·9 times as long as the first segment of the hind tarsus. Sub-genital plate bearing 22–30 hairs. Smaller, body 2–3·5 mm long, pale reddish brown aphids on *Cupressus macrocarpus*, *Thuja occidentalis* and *Juniperus virginiana* . ***cupressi*** (p. 136)

– Base of the sixth antennal segment 140–200μ(–230μ in alatiform specimens) long and bearing 7–12 hairs extending over most of its length. Fourth rostral segment 160–240μ long, bearing 5–7 accessory hairs and 1·8–2·2 times as long as the first segment of the hind tarsus. Sub-genital plate bearing 28–44 hairs. Larger, body 2·2–4·2 mm long, dark brown aphids living on the under sides of the small branches of *Cupressus* and *Juniperus* spp. ***fresai*** (p. 140)

Key to the alatae viviparae of the British species of *Cinara*

1 Fourth rostral segment 300–400μ long and bearing 24–34 hairs arranged in 4 longitudinal rows. Processus terminalis bearing 5–8 subapical setae and second antennal segment bearing 21–32 hairs. Fifth abdominal tergite bearing 18–40 hairs between the siphunculi. Hairs on the 3rd abdominal tergite up to 30–60μ long.

Body length 4·5–5·5 mm long, third antennal segment 700–900μ long, 10–15 times as long as the longer hair, 60–80μ, borne on it. Fifth antennal segment 350–600μ long, 2·6–3·4 times as long as the base of the sixth antennal segment. Base of the sixth antennal segment bearing 15–22 hairs. Eighth abdominal tergite bearing 41–64 hairs, the more dorsal hairs being 35–60μ

long and the more lateral hairs on the eighth tergite are 85–130μ long. Scleroites absent or very small. On *Larix* . . . ***kochiana*** (p. 143)

– Fourth rostral segment 130–380μ long, but bearing only 2–17 hairs which are arranged in only 2 longitudinal rows. Processus terminalis usually bearing only 3 or 4 subapical setae, if with 5–11, then second antennal segment bearing only 7–18 hairs, and if the fifth abdominal tergite bears more than 15 hairs between the siphunculi, then the hairs on the third abdominal tergite are up to 130–200μ long 2

2 (1) Large aphid, body length 4·5–6·5 mm. Hind tibia 4·0–6·4 mm and 65–120 times as long as the longest hair, 45–75μ, borne on it. Longest hair on the third abdominal tergite 35–80μ. Fifth abdominal tergite bearing 6–14 hairs between the siphunculi. Third antennal segment 0·65–1·3 mm long, 2·0–2·7 times as long as the second segment of the hind tarsi, which are 450–520μ long; 2·7–3·3 times as long as the fourth rostral segment, and 17–26 times as long as the longest hair, 40–65μ, borne on the third antennal segment. Processus terminalis bearing 7–11 subapical setae.

Fourth rostral segment, 300–370μ long and bearing 10–17 accessory hairs. Fifth antennal segment 460–580μ long, 1·8–2·3 times as long as the sixth antennal segment. Base of the sixth antennal segment 0·5–0·7 times as long as the fourth rostral segment and bearing 20–20 accessory hairs. Hind tarsus 1, 2·3–3·6 times as long as its basal diameter. Scleroites absent or very small. On *Picea* sp. . . . . ***piceae*** (p. 150)

– Body length 2·0–7·5 mm, but if more than 4·3 mm, then the longest hair on the third abdominal tergite is 80–320μ long and if only 80–120μ (*laricis*), then the dorsal abdominal hairs usually arise from conspicuous scleroites and the third antennal segment is 500–750μ long, but only 1·3–1·9 times as long as the second segment of the hind tarsus and 7–12 times as long as the longest hair, 50–80μ, borne on the third antennal segment. Fifth abdominal tergite bearing fewer than 8 or more than 15 hairs between the siphunculi. Processus terminalis usually bearing only 3 or 4 subapical setae but if with 6 or 7, then body 2·8–4·4 mm long, fifth antennal segment 280–360μ long, hind tibiae 2·0–3·3 mm long and 30–40 times as long as the longest hair, 75–95μ, borne on it (*escherichi*) or 14–17 times as long as the longest hair, 140–160μ, borne on it (*brauni*) 3

3 (2) Fifth abdominal tergite bearing 4–7 hairs between the siphunculi. Third antennal segment 400–700μ long, 1·8–2·6 times as long as the second segment of the hind tarsus, 220–350μ; and 5·5–12 times as long as the longest hair, 50–100μ, borne on it. Scleroites absent. Body length 2·2–4·0 mm. On *Pinus* 4

– Fifth abdominal tergite bearing 16–70 hairs between the siphunculi. Third antennal segment 0·8–2·2 times as long as the second segment of the hind tarsus, if more than 1·7 times then either the dorsal abdominal hairs arise from evident scleroites (*laricis* and *schimitscheki*) or the longest hairs on the third antennal segment are 140–320μ long (*bogdanowi* and *abieticola*) . . 6

4 (3) Fourth rostral segment 140–180μ long, fifth rostral segment 70–95μ long. Body length 2·2–4·0 mm. Hind tibiae 1·8–2·9 mm long, 14–25 times as long as the longest hair, 75–140μ, borne on them. Third antennal segment 5·5–9·0 times as long as the longest hair borne on it. Longest hair on 3rd abdominal tergite 15–75μ, on 8th abdominal tergite 90–150μ. Second antennal segment bearing 6–9 hairs, base of sixth antennal segment bearing 8–14 hairs. Fourth rostral segment bearing 6–10 hairs, subgenital plate bearing 20–42 hairs. Eighth abdominal tergite bearing 9–19 hairs. On *Pinus sylvestris* . . . . . ***pini*** (p. 160)

– Fourth rostral segment 200–240μ long, fifth rostral segment 95–140μ long . 5

5 (4) Processus terminalis bearing 4 subapical setae. Second segment of hind tarsus 250–310μ long, 1·1–1·4 times as long as the fourth rostral segment, which is 1·6–1·8 times as long as the fifth rostral segment, 120–140μ, 1·7–2·1 times as long as the first segment of the hind tarsus, and bears 6–8 accessory hairs. Ultimate rostral segment (segments 4+5) 1·1–1·4 times as long as the second segment of the hind tarsus. Third antennal segment 2·6–3·0 times as long as the fourth rostral segment, 6–8·5 times as long as the longest borne on it and bearing 1–6, usually 3–5 rhinaria. Hind tibia 2·5–3·2 mm long, 20–29 times as long as the longest hair, 110–130μ, borne on it. Longest hair on the third abdominal tergite 65–100μ, on the 8th tergite 120–160μ. Second antennal segment bearing 6–8 hairs, base of the sixth antennal segment bearing 9–13 hairs, subgenital plate bearing 24–38 hairs, and eighth abdominal tergite bearing 10–17 hairs. On *Pinus nigra* . ***acutirostris*** (p. 128)

– Processus terminalis bearing 6 or 7 subapical setae. Second segment of hind tarsus 300–360μ long, 1·4–1·7 times as long as the fourth rostral segment, which is 2·0–2·2 times as long as the fifth rostral segment, 95–110μ, 1·3–1·6 times as long as the first segment of the hind tarsus and bearing 8–11 accessory hairs. Ultimate rostral segment (segments 4+5) 0·9–1·1 times as long as the second segment of the hind tarsus. Third antennal segment 3·0–3·3 times as long as the fourth rostral segment, 8·5–11·5 times as long as the longest hair borne on it and bearing 4–10, usually 5–7, rhinaria. Hind tibia 2·9–3·2 mm long, 32–38 times as long as the longest hair, 75–95μ, borne on it. Longest hairs on the third abdominal tergite 30–55μ, on the eighth tergite 120–160μ. Second antennal segment bearing 7–13 hairs, base of sixth antennal segment bearing 12–16 hairs, subgenital plate bearing 39–58 hairs, eighth abdominal tergite bearing 17–22 hairs. On *Pinus sylvestris*. ***escherichi*** (p. 139)

6 (3) Base of the sixth antennal segment 250–320μ long and bearing 10–14 hairs. Hind tibiae 4·3–6·7 mm long and 14–24 times as long as the longest hair, 220–280μ, borne on them. Large aphid, body length 5·0–7·5 mm. Third antennal segment 0·8–1·2 mm long, 2·9–4·5 times as long as the longest hair, 220–320μ, borne on it. Longest hair on third abdominal tergite 160–320μ, on eighth abdominal tergite 250–320μ. Primary rhinaria without chitinized rims. Fourth rostral segment 290–370μ long and bearing 8–13 accessory hairs. Second segment of hind tarsus 420–570μ long, 2·6–3·5 times as long as the first tarsal segment which is 140–200μ long and 2·2–2·9 times as long as its own basal width. Second antennal segment bearing 18–25 hairs. Third antennal segment bearing 7–15, usually 8 or 9, rhinaria. Fourth antennal segment bearing 2–5, usually 3 or 4, rhinaria. Scleroites very small. On *Abies* and *Cedrus* . . . . . ***abieticola*** (p. 123)

– Base of the sixth antennal segment 100–240μ long. Hind tibia 1·3–4·1 mm long. Body length 2·0–5·3 mm, but if more than 4·5 mm, then primary rhinaria with a chitinized rim, longest hair on the third antennal segment less than 200μ long and on eighth abdominal tergite less than 250μ long. If the body is more than 4·5 mm long then either it is 2·0–2·3 times as long as the hind tibiae, 1·9–2·2 mm (*pectinatae*), or the hind tibiae are 2·2–3·2 mm long (*laricis* and *pinea*) and bear hairs only up to 120–150μ long (*laricis*) or the first tarsal segment is 210–330μ long and 4·3–5·7 times as long as its own basal width (*pinea*) or the hind tibiae are 2·4–3·5 mm long and the second tarsal segment 310–420μ long and 2·2–2·7 times as long as the first tarsal segment (*bogdanowi*) 7

7 (6) Rostral segments 4+5 together 1·3–1·5 times as long as the second segment of the hind tarsus, which is 0·9–1·2 times as long as the fourth rostral segment alone. Fourth rostral segment 300–370μ long and bearing 6 or 7 accessory

hairs. Second segment of hind tarsus 1·7–2·0 times as long as the first segment of the hind tarsus, 160–200μ. Second antennal segment bearing 7–13 hairs, base of the sixth antennal segment bearing 6–9 hairs, processus terminalis with 4 subapical setae and sub-genital plate bearing 50–70 hairs. Fifth abdominal tergite bearing 45–80 hairs between the siphunculi, eighth abdominal tergite bearing 27–60 hairs. Dorsal abdominal hairs arising from small dark scleroites 12–20μ in diameter, about twice the diameter of the hair bases. Third antennal segment 1·8–2·1 times as long as the second segment of the hind tarsus without or bearing only one rhinarium. Longest hair on eighth abdominal tergite 110–150μ long, 0·8–1·2 times as long as the longest hair, 120–150μ on the third antennal segment. Longest hair on the hind tibiae 150–170μ and on the third abdominal segment 70–110μ. Fifth antennal segment 1·2–1·5 times as long as the sixth segment and 0·4–0·6 as long as the fourth rostral segment which is 1·4–2·0 times as long as the first segment of the hind tarsus. On *Pinus nigra* . . . ***schimitscheki*** (p. 164)

– Rostral segments 4+5 together 0·5–1·3 times as long as the second segment of the hind tarsus which is rarely less than 1·3 times as long as the fourth rostral segment alone. Fourth rostral segment 130–310μ long but if more than 260μ then the longest hair on the third abdominal tergite is 120–240μ long and *either* the fourth rostral segment bears 8–15 accessory hairs, the longest hairs on the third antennal segment are 140–190μ, on the eighth abdominal tergite are 150–220μ, scleroites are absent, the second antennal segments bear 14–24 hairs, the base of the sixth antennal segment bears 11–19 hairs, the subgenital plate bears 22–40 hairs and the second segment of the hind tarsus is 2·2–2·7 times as long as the first segment of the hind tarsus, *or* if the fourth rostral segment bears 4–7 accessory hairs, then the third antennal segment is 1·2–1·7 times as long as the second segment of the hind tarsus, the longest hair on the eighth abdominal tergite is 1·2–1·9 times as long as the longest hair on the third antennal segment, the longest hairs on the hind tibiae are 190–270μ long and the longest of 17–27 hairs on the eighth abdominal tergite are 170–250μ long, the sixth antennal segment is 0·65–1·0 times as long as the first segment of the hind tarsus, which is 210–330μ long and the dorsal abdominal hairs arise from large scleroites (*pinea*), *or* the processus terminalis bears 6 or 7 hairs, the base of the sixth antennal segment bears 11–14 hairs, the fifth abdominal tergite bears 16–26 hairs between the siphunculi, the eighth abdominal tergite bears 11–16 hairs, the third antennal segment bears hairs up to 80–110μ long and usually 2–4 rhinaria (*brauni*) . 8

8 (7) A short-haired aphid. Third antennal segment 550–750μ long and 17–25 times as long as the longest hair, 20–45μ, borne on it. Hind tibia 2·6–3·2 mm long, 35–70 times as long as the longest hair, 50–80μ, borne on it. Longest hair on the 3rd abdominal tergite only 20–40μ long, on the eighth abdominal tergite 70–100μ. Fifth abdominal tergite bearing 16–25 hairs between the siphunculi. Second segment of hind tarsus 440–570μ long, 2·4–2·8 times as long as the fourth rostral segment, and 1·0–1·8 times as long as the diameter of the siphuncular cone.

Processus terminalis 12–20% of the total length of the sixth antennal segment. Base of the sixth antennal segment 150–190μ long, 0·9–1·2 times as long as the fourth rostral segment and bearing 7–9 hairs. Fourth rostral segment bearing 4–8 accessory hairs. Dorsal abdominal hairs arising from small scleroites at the hair bases. On *Larix* . . . . ***boerneri*** (p. 129)

– Longer-haired aphids. Third antennal segment 300–900μ long and 1·5–12 times as long as the longest hair, 50–250μ, borne on it. Hind tibia 1·4–3·5 mm long, 5·5–23 times as long as the longest hair, 95–350μ, borne on it. Longest hairs on the third abdominal tergite 70–230μ long, on the eighth

abdominal tergite 100–260μ long, if less than 130μ the fifth abdominal tergite usually bearing 24–54 hairs between the siphunculi. Second segment of the hind tarsus less than 2·4 times as long as the fourth rostral segment or, if longer, then the body and appendages usually bear long fine hairs, those on the antennae being 85–230μ, on the hind tibiae 180–350μ, on the third abdominal tergite 100–230μ and on the eighth abdominal tergite 120–260μ 9

9 (8) Dorsal abdominal hairs arising from conspicuous dark scleroites (Text-fig. 32), 45–120μ in diameter, the larger scleroites being 3–6 times the diameter of the hair bases borne on them. Third antennal segment is 2·2–3·0 times as long as the fourth rostral segment. Longest hair on third antennal segment 120–170μ, on third abdominal tergite 150–240μ long. The fifth rostral segment is 210–330μ long. Fifth antennal segment 1·1–1·7 times as long as the sixth antennal segment. Base of the sixth antennal segment 150–230μ, 0·65–0·95 times as long as the fourth rostral segment. Hind tibiae 2·2–3·2 mm long, 9–16 times as long as the longest hair, 190–270μ, borne on them.

Body length 3·2–5·3 mm. Third antennal segment 500–800μ long, 3·5–6·0 times as long as the longest hair borne on it and 1·2–1·7 times as long as the second segment of the hind tarsus. Processus terminalis 40–85μ long and bearing 4 sub-apical setae. Fourth rostral segment 210–270μ long, bearing 4–6 accessory hairs and 1·6–2·1 times as long as the fifth rostral segment. Second segment of hind tarsus 1·4–2·0 times as long as the first segment of the hind tarsus which is 4·3–5·7 times as long as its basal width. On *Pinus sylvestris* . . . . . ***pinea*** (p. 156)

– Dorsal abdominal scleroites small or absent or, if large and conspicuous, then the third antennal segment is 3·0–4·3 times as long as the fourth rostral segment, the longest hair borne on the third antennal segment is 50–120μ long, and on the third abdominal tergite is 70–150μ long and the fifth rostral segment is 85–110μ long; and *either* the third antennal segment is 7–12 times as long as the longest hair borne on the third segment, the hind tibia is 2·2–3·0 mm long, 16–23 times as long as the longest hair borne on it, the base of the sixth antennal segment is 100–160μ long, the processus terminalis is 25–45μ long, the fourth rostral segment is 160–200μ long and the fifth rostral segment is 85–110μ long (*laricis*), *or* the first segment of the hind tarsus is 130–180μ long and 2·6–4·0 times as long as its own basal diameter, the longest hair on the hind tibia is 120–150μ, the third antennal segment is 300–550μ long and 1·8–2·1 times as long as the second segment of the hind tarsus and 1·6–2·3 times as long as the fourth rostral segment, which is 2·1–2·8 times as long as the fifth rostral segment; the fifth antennal segment is 0·8–1·1 times as long as the sixth antennal segment, the base of the sixth antennal segment is 160–200μ long and 0·45–0·6 times as long as the fourth rostral segment, whish is 190–250μ long and bears 7–8 accessory hairs (*pectinatae*) . . 10

0 (9) Processus terminalis bearing 6 or 7 sub-apical setae. Fourth rostral segment 260–300μ long and bearing 4–7 accessory hairs. Second antennal segment bearing 8–12 hairs. Fifth abdominal tergite bearing 16–20 hairs between the siphunculi, eighth abdominal tergite bearing 12–16 hairs.

Third antennal segment 1·3–1·7 times as long as the second segment of the hind tarsus, 6·5–8·0 times as long as the longest hair, 80–110μ, borne on it and bearing 9–13 rhinaria. Longest hair on the eighth abdominal tergite 130–200μ, 1·5–1·9 times as long as the longest hair on the third antennal segment. Fifth antennal segment 1·0–1·2 times as long as the sixth antennal segment. First tarsal segment 4–5 times as long as its basal diameter. Scleroites absent. Body 2·8–3·7 mm long. Hind tibiae 2·1–2·5 mm long, 14–17 times as long as the longest hair, 140–160μ, borne on them. On *Pinus nigra* . . . . . ***brauni*** (p. 133)

– Processus terminalis bearing 3 or 4, or exceptionally 2 or 5 sub-apical setae. Fourth rostral segment usually only 130–240μ long but if 240–290μ long, then bearing 8–15 accessory hairs and the second antennal segment bears 14–26 hairs, the fifth abdominal tergite bears 30–55 hairs between the siphunculi and the eighth abdominal tergite bears 24–42 hairs (*bogdanowi*) . 11

11 (10) Fourth rostral segment 230–300μ long and bearing 8–15 accessory hairs. Third antennal segment 500–900μ long, and 1·7–2·2 times as long as the second segment of the hind tarsus, which is 2·2–2·7 times as long as the first segment of the hind tarsus. Fourth antennal segment 240–440μ long, 1·1–1·7 times as long as the sixth antennal segment, fifth antennal segment 300–480μ long and 1·5–1·9 times as long as the sixth antennal segment.

Body 3·2–5·0 mm long. Siphuncular cone 500–700μ in diameter. Hind tibiae 2·4–3·5 mm long. Processus terminalis bearing 4 subapical setae. On *Picea* . . . . . ***bogdanowi*** (p. 132)

– Fourth rostral segment 130–250μ long and bearing 2–8 accessory hairs. If fourth rostral segment more than 210μ long, then the third antennal segment is 300–660μ long, 0·8–1·6 times as long as the second segment of the hind tarsus which is 2·8–4·4 times as long as the first segment of the hind tarsus, the fourth antennal segment is 120–240μ long and 0·7–1·2 times as long as the sixth antennal segment, the fifth antennal segment is 160–280μ long and 0·8–1·4 times as long as the sixth antennal segment 12

12 (11) Third antennal segment 500–750μ long, 7·5–12·0 times as long as the longest hair, 50–80μ, borne on it. Dorsal abdominal hairs usually arising from dark scleroites, the largest of which have a diameter several times that of the bases of the hairs borne on them. Fifth antennal segment 1·7–2·7 times as long as the sixth antennal segment. Longest hair on the third abdominal tergite 70–110μ long. Third antennal segment 1·3–1·9 times as long as the second segment of the hind tarsus, which is 2·1–2·7 times as long as the first segment of the hind tarsus.

Body length 3·1–4·8 mm. Hind tibiae 2·2–3·0 mm long, 16–23 times as long as the longest hair, 120–150μ, borne on them. Longest hair on the eighth abdominal tergite 1·7–3·0 times as long as the longest hair on the third antennal segment. On *Larix* . . . . . ***laricis*** (p. 146)

– Third antennal segment 1·5–7·0 times as long as the longest hair borne on it. Dorsal abdominal hairs without or with only very small scleroites at their bases, or if the scleroites are more than twice the diameter of the hair bases (*pectinatae*) then the fifth antennal segment is 0·8–1·1 times as long as the sixth antennal segment and the second segment of the hind tarsus is 1·7–2·1 times as long as the first segment of the hind tarsus. Fifth antennal segment usually 0·7–1·4 times as long as the sixth segment, if 1·5–2·0 times as long (*pinihabitans*) the longest hair on the third abdominal tergite is 120–180μ long, on the third antennal segment is 120–160μ long, and the third antennal segment is 2·0–2·5 times as long as the second segment of the hind tarsus. Hind tibia 5·5–16 (exceptionally—18) times as long as the longest hair borne on it. Longest hair on the eighth abdominal tergite 0·8–2·0 times as long as the longest hair on the third antennal segment, except in *pectinatae* . . 13

13 (12) Many dorsal abdominal hairs arising from scleroites, the largest of which have a diameter three times that of the hair bases. Dorsal length of first segment of hind tarsus 150–180μ, ventral length 190–270μ and 3·9–5·6 times as long as its proximal diameter. Body 3·2–5·0 mm long and 2·0–2·3 times as long as the hind tibiae, which are 1·4–2·2 mm long. Longest hairs on the eighth abdominal tergite 170–210μ long and 1·6–2·8 times as long as the longest hairs on the third antennal segment, which are 75–120μ long. Fourth rostral segment 190–250μ long, 2·1–2·8 times as long as the fifth rostral

segment and 0·8–1·1 times as long as the first segment of the hind tarsus. Fifth antennal segment 0·8–1·1 times as long as the sixth. Second antennal segment bearing 6–8 hairs, base of the sixth antennal segment bearing 5–7 hairs. Green aphid on *Abies*. . . . . ***pectinatae*** (p. 148)

– Dorsal abdominal scleroites absent or, if present, not exceeding twice the diameter of the hair bases. First segment of hind tarsus 15–80μ long dorsally, 80–160μ long ventrally, and 2·1–3·6 (exceptionally 4·0) times as long as its proximal diameter. Body 2·0–4·5 mm long, 1·2–2·2 times as long as the hind tibiae, only exceeding 2·0 in *pilicornis*. Longest hair on the eighth abdominal tergite 100–260μ long, 1·0–1·7 (rarely 2·0) times as long as the longest hair, 70–250μ, on the third antennal segment. Fourth rostral segment 1·5–2·2 times as long as the fifth rostral segment and usually 1·2–2·4 as long as the first segment of the hind tarsus. If fourth rostral segment 1·0–1·3 times as long as the first segment of the hind tarsus (*pinihabitans*), then fifth antennal segment 1·5–2·0 times as long as the sixth antennal segment. Second antennal segment bearing 5–20 hairs, base of the sixth antennal segment bearing 5–20 hairs. Brown, reddish or yellowish aphids on *Pinus*, *Picea* and Cupressaceae 14

4 (13) Third antennal segment 550–750μ long, 3·8–5·2 times as long as the fourth rostral segment which is 130–170μ long, bears 4 accessory hairs and is 1·0–1·3 times as long as the first segment of the hind tarsi. Third antennal segment 2·0–7·5 times as long as the second segment of the hind tarsus, which is 260–340μ long and 2·0–2·3 times as long as the first segment of the hind tarsus. Fifth antennal segment 240–380μ long and 1·5–2·0 times as long as the sixth antennal segment, which is 120–160μ long. Base of the sixth antennal segment bearing 7–11 hairs. Second antennal segment bearing 6–8 hairs.

Processus terminalis bearing 4 subapical setae. Eighth abdominal tergite bearing 11–22 hairs. On *Pinus sylvestris* . . ***pinihabitans*** (p. 162)

– Third antennal segment 300–600μ long, 1·8–3·6 times as long as the fourth rostral segment, which is 130–250μ long and is 1·2–2·2 times as long as the first segment of the hind tarsus. Third antennal segment 0·9–1·6 times as long as the second segment of the hind tarsus, which is 240–540μ long and 2·6–4·4 times as long as the first segment of the hind tarsus. Fifth antennal segment 160–300μ long and 0·7–1·4 times as long as the sixth antennal segment, which is 110–240μ long. Base of the sixth antennal segment bearing 5–20 hairs. Second antennal segment bearing 7–20 hairs. On *Picea* and Cupressaceae 15

(14) Membrane of the fore wing characteristically pigmented (Text-fig. 20), media once branched. Second segment of the hind tarsus 300–380μ long, 1·3–1·7 times as long as the fourth rostral segment which is 190–250μ long. Primary rhinaria with a chitinized rim. Third antennal segment 2·0–3·5 times as long as the longest hair, 150–210μ, borne on it, and 1·3–1·6 times as long as the second segment of the hind tarsus, which is 0·5–1·0 times as long as the siphuncular diameter. Hind tibia 2·0–2·6 mm long and 7·5–10 times as long as the longest hair, 190–300μ, borne on it. Third antennal segment bearing only 1–3 rhinaria. Base of the sixth antennal segment bearing 12–20 hairs. Processus terminalis bearing 3 or 4 sub-apical setae. Processus terminalis only 6–18% of the total length of the sixth antennal segment. On *Picea*.

costata (p. 134)

– Wing membrane uniformly transparent, media usually twice branched (Text-fig. 37). Second segment of the hind tarsus 1·6–2·7 times as long as the fourth rostral segment, if less than 1·8 then either the primary rhinaria without a chitinized rim (subgen. *Cupressobium*) or the longest hair on the

hind tibia only 95–180μ long (*stroyani*). Primary rhinaria with or without a chitinized rim but if with, then the third antennal segment is 3·0–3·7 times as long as the longest hair, 70–160μ, borne on it and 0·9–1·3 times as long as the second segment of the hind tarsus and the base of the sixth antennal segment bears 6–17 but mostly 9–12 hairs. Processus terminalis 14–29% of the total length of the sixth antennal segment except in *tujafilina* (8–15%), in which the fourth rostral segment is only 130–180μ long. . . . 16

16 (15) Longest hair on the third abdominal tergite 55–110μ long. Hind tibiae 9·5–17 times as long as the longest hair, 140–180μ, borne on the hind tibiae. Third antennal segment 3·5–7·0 times as long as the longest hair, 70–110μ, borne on it. Base of the sixth antennal segment bearing 9–17 hairs and 0·6–0·8 times as long as the fourth rostral segment.

Processus terminalis bearing 4 sub-apical setae. On *Picea* ***stroyani*** (p. 165)

– Longest hair on the third abdominal tergite 105–240μ long. Hind tibiae 5·5–11 but rarely more than 9·5 times as long as the longest hair, 140–360μ, borne on the hind tibia. If the longest hind tibial hair is less than 180μ long (*tujafilina*), then the fourth rostral segment 130–180μ long and the third antennal segment is 2·0–2·9 times as long as the longest hair, 120–200μ, borne on it, the longest hair on the third abdominal tergite is 120–210μ long and the base of the sixth antennal segment is 0·9–1·3 times as long as the fourth rostral segment. Third antennal segment 1·5–5·0 times as long as the longest hair which is rarely 80–110μ, but usually 110–250μ long . . 17

17 (16) Processus terminalis bearing 4 sub-apical setae. Primary rhinaria with a chitinized rim. Third antennal segment 3·0–3·5 times as long as the longest hair, 80–160μ, borne on it. Base of sixth antennal segment 0·6–0·9 times as long as the fourth rostral segment which is 160–250, rarely less than 190μ, long. Longest hair on hind tibia 160–240μ. Second segment of hind tarsus 350–420μ and 1·1–2·3 times as long as the diameter of the siphuncular cone. On *Picea* . . . . . ***pilicornis*** (p. 152)

– Processus terminalis bearing only 3 sub-apical setae. Primary rhinaria without a chitinized rim. Third antennal segment 1·8–2·9 times as long as the longest hair on it. Base of the sixth antennal segment 0·9–1·7 times as long as the fourth rostral segment, which is 130–210μ long, but if more than 180μ long, then the longest hair on the third antennal segment is 190–250μ long. Longest hair on hind tibia 140–350μ, if less than 230μ (*tujafilina*), then the second segment of the hind tarsus is only 240–340μ long. On Cupressaceae (subgen. *Cupressobium*) 18

18 (17) Base of the sixth antennal segment bearing only 5 or 6 hairs. Fourth rostral segment 130–170μ long and bearing 2–4 accessory hairs. Third antennal segment bearing 1–6 rhinaria, usually confined to the distal half of the segment.

Fifth antennal segment 180–240μ long. Processus terminalis 30–50μ long, 15–23% of the total length of the sixth antennal segment. On *Cupressus*, *Juniperus* and *Thuja* . . . . . ***cupressi*** (p. 136)

– Base of the sixth antennal segment bearing 6–14 but rarely less than 8 hairs. Fourth rostral segment 130–210μ long and bearing 4–8 accessory hairs. Third antennal segment bearing 3–11 rhinaria, usually extending onto the proximal half of the segment 19

19 (18) Tibiae pale to dusky, rarely dark brown, except for the distal apex which is dark. Processus terminalis 10–30μ long, 8–16% of the total length of the sixth antennal segment. Third antennal segment (Text-fig. 38) 300–450μ long, 1·0–1·9 but rarely less than 1·3 times as long as the diameter of the siphuncular cone. Fifth antennal segment 160–200μ long. Longest hair on eighth abdominal tergite 130–210μ long. Second segment of hind tarsus

(Text-fig. 39) 240–330μ long, 0·7–1·4, usually 1·0–1·3 times as long as the diameter of the siphuncular cone (Text-figs 40 & 41). On *Callitris* and *Thuja* . . . . . ***tujafilina*** (p. 166)

– Tibiae black or black at base and apex and dark brown in the middle. Processus terminalis 35–80μ long, 14–29% of the total length of the sixth antennal segment. Third antennal segment 350–600μ long, 0·8–1·6 but rarely more than 1·3 times as long as the diameter of the siphuncular cone. Fifth antennal segment 180–300μ, rarely less than 200μ long. Longest hair on eighth abdominal tergite 190–260μ, rarely less than 210μ long. Second segment of hind tarsus 280–400μ long, 0·6–1·2, usually 0·7–1·0 times as long as the diameter of the siphuncular cone. On *Cupressus* and *Juniperus* . 20

20 (19) Second segment of hind tarsus 1·6–2·1, usually 1·7–2·0 times as long as the fourth rostral segment, which bears 5–8 accessory hairs. Second antennal segment bearing 10–14 hairs. Fifth abdominal tergite bearing 60 or more hairs between the siphunculi. Third antennal segment 1·2–1·6, rarely less than 1·3 times as long as the second segment of the hind tarsus. Base of the sixth antennal segment 0·8–1·3, usually 1·0–1·3 times as long as the fourth rostral segment. Longest hair on the eighth abdominal tergite 0·9–1·2 times as long as the longest hair on the third antennal segment. Radial sector of fore wing often not reaching wing apex. On *Cupressus* and *Juniperus* . . . . . ***fresai*** (p. 140)

– Second segment of hind tarsus 2·0–2·8, usually 2·4–2·6 times as long as the fourth rostral segment, which bears 4 accessory hairs and is 1·4–1·6 times as long as the first segment of the hind tarsus. Second antennal segment bearing 7–11 hairs. Fifth abdominal tergite bearing 25–45 hairs between the siphunculi. Third antennal segment 1·0–1·3 times as long as the second segment of the hind tarsus. Base of the sixth antennal segment 1·1–1·7, usually 1·4–1·6 times as long as the fourth rostral segment. Longest hair on the eighth abdominal tergite 1·2–1·4 times as long as the longest hair on the third antennal segment. Radial sector of fore wing reaching wing-apex. On *Juniperus* . . . . . ***juniperi*** (p. 141)

The British Species of *CINARA*

Cinara abieticola (Cholodkovsky)

(Text-figs 1–5)

Aphis borealis Curtis, 1828 : 201. [Types unknown. 'Floating floes of ice in the Polar Sea . . . as far north as 82°.']

Lachnus confinis Koch, 1856 : 245 [No types. Collection data not given, presumably Germany.]

[*Lachnus grossus* (Kaltenbach) Cholodkovsky, 1896*a* : 145; 1898*a* : 656–657; 1902 : 6; Mordwilko, 1929 : 27; Gillette & Palmer, 1930 : 544, 551. Misidentifications.]

Lachnus abieticola Cholodkovsky, 1899 : 470–471. [Types unknown. Western Siberia: Tomsk, Summer 1898, apterae viviparae (*W. Plotnikov*)]; 1902 : 6.

Lachniella cilicica Del Guercio, 1909 : 287, 297–301. [Types unknown. Italy: Castelfalfi, May, 1893, aptera vivipara (*Biondi*)]; Jackson, 1919 : 164.

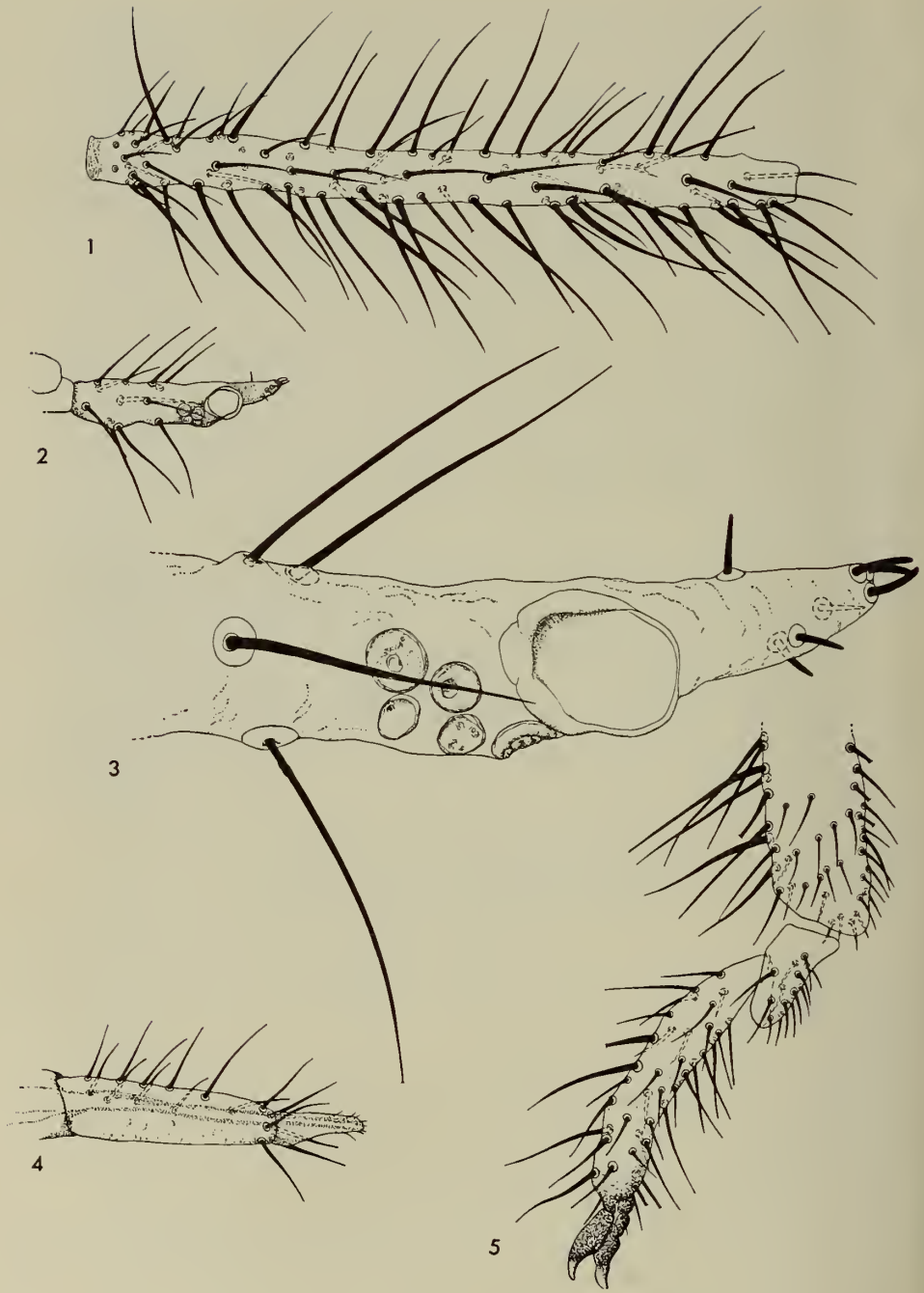
Lachniella cilicica v. *cecconii* Del Guercio, 1909 : 297. [As for *cilicica* s. str.]

Lachnus vanduzei Swain, 1919 : 50–51. [Types, University of California. California; spruce, September & November, apterae & alatae viviparae, 1914 (*E. P. Van Duzee & E. O. Essig*).]

[*Dilachnus piceae* (Walker) Swain, 1921 : 225–227, nec Panzer, 1801.]

Panimerus cilicica (Del Guercio) Theobald, 1929 : 142–145.

Panimerus vanduzei (Swain) Theobald, 1929 : 154–156, partim, the Irish specimens.



FIGS 1–5. *Cinara abieticola*, aptera vivipara. 1, third antennal segment, × 87. 2, sixth antennal segment, × 87. 3, processus terminalis, × 450. 4, fourth and fifth rostral segments, × 110. 5, hind tarsus, × 87.

? *Lachnus lasiocarpae* Gillette & Palmer, 1930 : 543–544. [Types, USNM. Catalogue no. 42082. 'Paratypes' at Fort Collins. COLORADO: *Abies lasiocarpa*.]
Dilachnus pubescens Wellenstein, 1930 : 743–747, 752. [Types unknown. Collection data not given, presumably GERMANY: Hann, alate males and oviparae.]
? *Cinara lasiocarpae* (Gillette & Palmer) Gillette & Palmer, 1931 : 858; Palmer, 1952 : 34.
Cinara cecconii (Del Guercio) Braun, 1938 : 478.
[*Cinara grossus* (Kaltenbach) Blanchard, 1939 : 862–864. Misidentification.]
Dinolachnus cecconii (Del Guercio) Börner, 1940 : 1.
Neochmosis cilicica (Del Guercio) Kloet & Hincks, 1945 : 72.
[*Cinara grossa* (Cholodkovsky nec Kaltenbach) Mordwilko, 1948 : 201–202.]
Todolachnus abieticola (Cholodkovsky) Börner, 1952 : 44; Pašek, 1954 : 266–269; Heinze, 1962 : 173; Gomez-Menor, 1962 : 390–393.
Todolachnus confinis (Koch) Börner, 1952 : 44; Heinze, 1962 : 173.
Cinara abieticola (Cholodkovsky) Hottes & Essig, 1954 : 95–97; Szelegiewicz, 1962 : 78–79.
[*Dinolachnus piceae* (Panzer) Aizenberg, 1956 : 139; Pintera, 1966 : 281. Misidentifications.]
Cinaria (*Pitsaria*) *vanduzei* (Swain) Aizenberg, 1956 : 139.
Todolachnus abieticola subsp. *bulgarica* Pintera, 1959 : 71. [Holotype, Academy of Science, Prague. BULGARIA: Rila, *Abies alba bulgarica*, August, 1957, apterae viviparae (*A. Pfeffer*).]
Cinara (*Todolachnus*) *abieticola* (Cholodkovsky) Heikinheimo, 1963 : 185; Çanakçioğlu, 1966 : 140–141.
[*Cinara piceae* (Panzer) Shaposhnikov, 1964 : 522. Misidentification.]
Dinolachnus abieticola (Cholodkovsky) Hille Ris Lambers, 1966 : 124.

MATERIAL EXAMINED.

ENGLAND: London, 'conifer', 15.ix.1948, 1 aptera (*A. Smith*); 'near conifer', 23.vi.1969, 1 apt., 1 alata (*B. J. English*); Southgate, *Cedrus deodora*, 1.vii.1955, 4 al. (*Parks Superintendent*); Surrey, Chertsey, 'near cedar', March 1967, 8 apt. & 1 alatoid nymph (*Public Health Inspector*); Essex, Havering, 'cedar', 12.v.1967, 1 apt., 1 al., 1 alatoid nymph (*Health & Welfare Department*); Worcs., Stourbridge, 'crawling under door', 6.v.1949; 2 apt., 1 immature (*Ministry of Health*); Devon, Germansweek, Beauworthy, 'fir', 4.vi.1948, 1 al. (*E. W. Powell*). IRELAND: Avondale, Rathdrum, *Pinus*, 2.vi.1913, 1 apt., 2 al. (*F. V. Theobald*). SCOTLAND: Moray, Rothes, *Abies pectinata*, 24–27.ix.1917, 1 apt. (*D. J. Jackson*); Elgin, Pitgaveny, *Abies nobilis* + *A. grandis*, 12.vi.1923, 2 apt., 3 al., 4 alatoid nymphs (*A. Stables*); Roxburgh, Craik Forest, *Abies alba*, 6.iii.1964, 1 apt. (*C. I. Carter*); Argyll, Kilmum arboretum, *Abies lasiocarpa*, 9.vii.1965, 1 apt. (*C.I.C.*).

CZECHOSLOVAKIA: Košice-Črmel, *Abies alba*, 3.vi.1948, 2 apt. (*V. Pašek*). DENMARK: Palagaard Forest, *A. alba*, 18.vi.1964 (*C. I. Carter*). FRANCE: Vosges, Retournermer, 7–31.vii.1930, 2 al. (*M. E. Mosely*). GERMANY: Unteres Weldental, *A. alba*, 15.vi.1961, 1 apt. (*H. Heinze*). SPITZBERGEN: W. of N.E. Land, S. of Leecap, N. of Wahlenberg Bay, c. 1000 ft, 8.viii.1924, 1 al. (*H. M. Clutterbuck*) (other specimens from this series in the Hope Museum, Oxford). TURKEY: Bolu-Aladag, 1360 m., *Abies bornmuelleri*, 4.vii.1964, 18 apt., 1 alatoid nymph (*H. Çanakçioğlu*). INDIA: Mussourie, 6500 ft, under bark of *Cedrus deodora*, July 1920, 2 al., 2 alatoid nymphs (*S. N. Chatterjee*); Rhotang Pass, 13,800 ft, 4.vi.1955, 3 al. (*A. P. Kapaur*). PAKISTAN: Murree, *Abies pindrow*, 2 adult and 2 immature oviparae, 25.xi.1958 (*M. Ghani*); Murree, in spider's web on fir, 2 alate males, 25.xi.1958 (*M. Ghani*).

U.S.A.: California, Berkeley, spruce, 2.ix.1914, 1 aptera [cotype of *vanduzei*]; on pavement, 3.iii.1961, 2 al. (*O. W. Richards*). CANADA: Labrador, Mealy Mts, 31.viii.1958, 2 oviparae (*British School Boys' Exploration Society*); New Brunswick, Acadia Stn, *Abies balsamea*, 8.vi.1960, 2 apt. (*M. E. MacGillivray*).

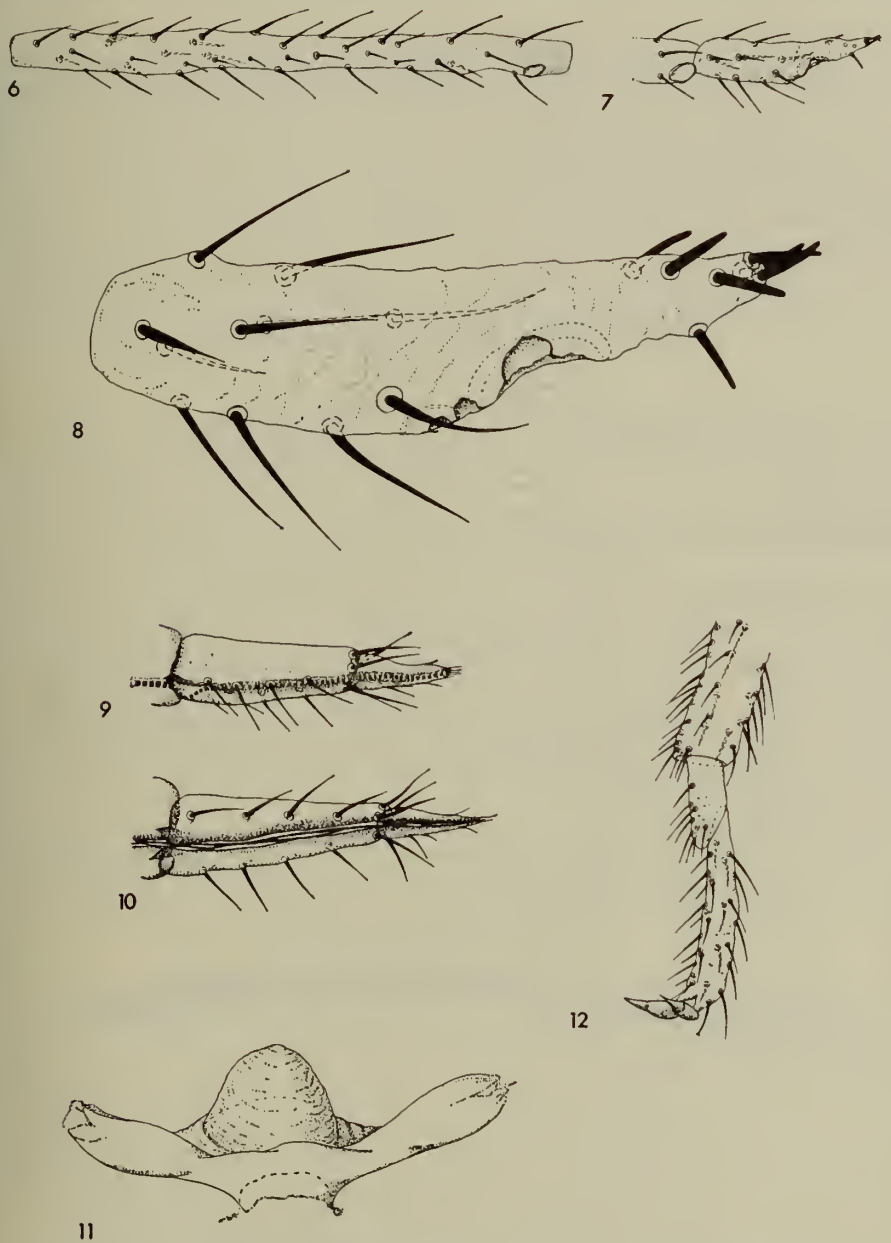
HOST-PLANTS. Specimens have been seen from *Abies alba* (= *pectinata*), *A. balsamea*, *A. bornmuelleriana*, *A. grandis*, *A. lasiocarpa*, *A. nordmanniana*, *A. pindrow* and *Cedrus deodora*. *Cinara abieticola* was described from *Abies sibirica*, (as *Lachnus cilicica*) from *A. cilicica*, and is also recorded from *Abies procera* (= *nobilis*) and *A. religiosa*.

DISTRIBUTION. Specimens have been seen from Czechoslovakia, Denmark, England, France, Germany, Ireland, Scotland, Spitzbergen, Turkey, India, Pakistan, California, Labrador and New Brunswick. *Cinara abieticola* was described from Western Siberia, as *Lachnus cilicica* from Italy, as *bulgarica* from Bulgaria and is also recorded from Austria, Finland, Norway (Stenseth & Bekke, 1968 : 237), Portugal (Ilharco, 1968*a* : 118), Spain, Sweden, Yugoslavia, U.S.S.R., Latvia (Rupais, 1961 : 16–17), Ukraine (Mamontova, 1963 : 21, as *piceae*), Argentina (Blanchard, 1939 : 862–864, as *grossa*) and the Eastern and Western coasts of North America (Hottes, 1960 : 221). Börner (1952 : 44) lists the Italian synonym but says that it is not certain that Italian specimens really belong to the northern European species.

BIOLOGY. Apterae viviparae outnumber alatae viviparae in March and May in Britain but alatae outnumber apterae in June and July. Only apterae viviparae are known for September and *Cinara abieticola* does not seem to have been collected in Britain in August. The summer is said to be spent on the roots of *Abies* in special chambers prepared by ants. Oviparae and alate males have been seen from *Abies pindrow* from Pakistan and were described as *Lachnus pubescens* by Wellenstein (1930 : 743–745) from Europe. Heikinheimo (1963 : 185) has recorded natural enemies.

NOTES. *Cinara abieticola* is a large aphid which sporadically occurs in large numbers between March and June. Heikinheimo has discussed the possibility that *Aphis borealis* Curtis is the earliest name for *abieticola*. Börner (1952 : 44) has identified shorter haired specimens with *Todolachnus confinis* (Koch), presumably because of the long rostrum mentioned in the original description. *Lachnus confinis* was apparently described from a vagrant alata and so was probably fully pigmented. The hind tibiae are figured as being yellow and apart from the length of the rostrum the description fits *pilicornis*. Hottes (1954 : 260) says that *C. lasiocarpae* is very similar to *abieticola* but that it is smaller and has paler legs, bearing shorter and more strongly inclined hairs. Most of the specimens of this group studied have been separable by this combination of characters but intermediates in all characters occur. Larger specimens from Colorado may have rather dark tibiae bearing inclined hairs and the short-haired European forms of *abieticola* have inclined tibial hairs. It seems likely that *Cinara vanduzei*, *C. cecconii*, *C. pubescens*, *C. confinis* (Koch) Börner, *C. lasiocarpae* and *C. abieticola* ssp. *bulgarica* are all forms of *abieticola*. If there really are two or more species, then they are both now probably holarctic

in distribution. *Cinara hattorii* Kono & Inouye, 1938 (= *konoi* Inouye, 1956) and *C. longipennis* (Matsumura, 1917) from *Abies* in Japan are placed in the subgenus



FIGS 6–12. *Cinara acutirostris*, aptera vivipara. 6, third antennal segment, × 87. 7, apex of fifth and sixth antennal segment, × 87. 8, sixth antennal segment, × 450. 9 & 10, fourth and fifth rostral segments with eight accessory hairs, different views, × 110. 11, mesosternal tubercle, × 110. 12, hind tarsus, × 110.

Dinolachnus with *abieticola* by Inouye (1970 : 88–90) and *Cinara sonata* Hottes, 1955, and *C. grande* Hottes, 1956, from *Abies* in North America are also said to be related to *abieticola*.

Aizenberg (1956 : 139) recognized, presumably from the description alone, that *vanduzei* Swain was not *piceae* Panzer (= *grossa*). Aizenberg had apparently not seen Hottes & Essig (1954 : 95–97), in which *vanduzei* is placed as a synonym of *abieticola* and concluded that *vanduzei* was related to *Cinara bogdanowi*. *Pitsaria* is presumably a lapsus for *Pityaria*.

Type-species of *Dinolachnus* Börner, 1940, as *Lachniella cilicica* var. *cecconii* Del Guercio.

Cinara acutirostris Hille Ris Lambers

(Text-figs 6–13)

[*Cinara montanicola* Börner; Stroyan, 1955 : 332–333. Misidentification.]
Cinara acutirostris Hille Ris Lambers, 1956 : 246–249. [Types colln. D. Hille Ris Lambers, described from NETHERLANDS, CZECHOSLOVAKIA, ITALY, ENGLAND]; Stroyan, 1957 : 355; Pintera, 1966 : 309.
Cinaria acutirostris (Hille Ris Lambers) Heinze, 1962 : 166.

MATERIAL EXAMINED.

ENGLAND: Cambridge, Botanical Gardens, *Pinus nigra* var. *calabrica*, 20. iii.1951, first instar larvae of fundatrices and egg-breakers; 25.vi.1951, 12 apterae and 2 alatae viviparae; 2.vii.1951, 4 apt., 8 al.; 13.x.1950, 4 oviparae, 1 apterous male (*V.F.E.*); 9.x.1950, 18 oviparae, 1 apterous male (*H. L. G. Stroyan* coll. & colln.), except for 6 oviparae in BMNH; Kent, Wye, 40′ trap, 3.vii.1969, 1 al. (*N. R. Maslen*), Forestry Commission Colln.

FRANCE: Beauregard, *Pinus nigra*, 11.v.1966, 2 fundatrices (*Laurent* coll.), D. Hille Ris Lambers colln. ITALY: Calabria, Sila, *Pinus calabrica*, August 1968, 2 apterae (*Tremblay* coll.), D.H.R.L. colln.

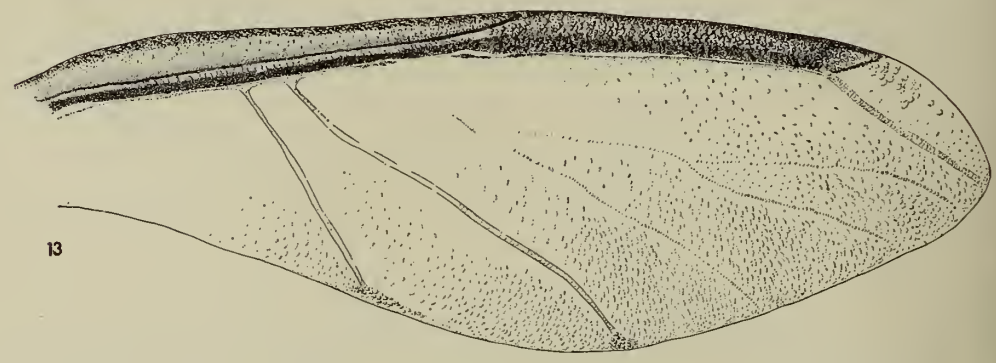


FIG. 13. *Cinara acutirostris*. Fore wing, × 30.

HOST-PLANTS. Seen from *Pinus nigra* var. *maritima* (= *calabrica*), originally described from *P. nigra* (= *austriaca*) and also recorded (Ilharco, 1968*b* : 248) from *Pinus pinea*.

DISTRIBUTION. Specimens have been seen from England, France and Italy, were originally described from the Netherlands and are also recorded from Bulgaria, Czechoslovakia and Portugal.

BIOLOGY. Eggs hatch in the second half of March at Cambridge. Alatae viviparae are produced in the second half of June and the first week in July. Oviparae and apterous males were collected in October. *Cinara acutirostris* has not been seen from Britain in August or September. When present it may occur in large numbers and be the prey of various natural enemies. Recorded in the original description from a nest of the sphecoid wasp *Psenulus fuscipennis*. Stroyan (1955 : 332) records *Coccinella quadripuncta* as a predator.

Cinara boerneri Hille Ris Lambers

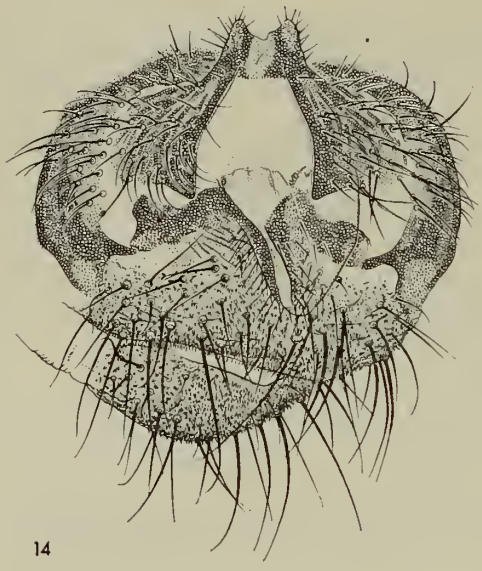
(Text-figs 14–18)

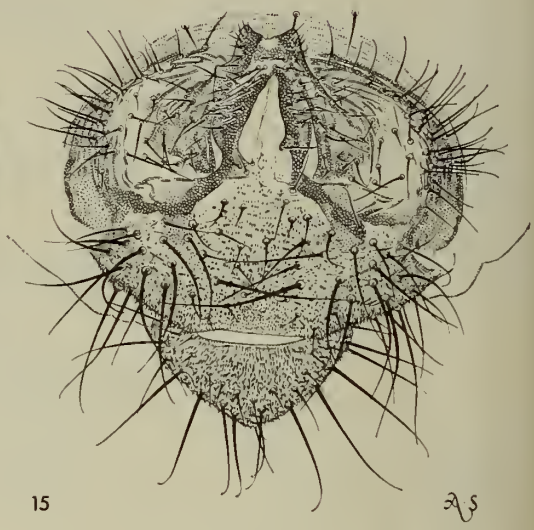
[*Aphis laricis* Walker, 1848 : 102–103, partim, second variety; 1852 : 957–958, partim.]
? *Lachnus laricis* Koch, 1856 : 241–243. [No types. Locality and year not given, presumably GERMANY]: Cholodkovsky, 1898 : 666, partim, nec Walker, 1848.
[*Lachnus pinicolus* (Kaltenbach) Buckton, 1881 : 52–53, partim. Misidentification.]
? *Lachniella laricis cuneomaculata* Del Guercio, 1909 : 291–293. [Types unknown. ITALY: Pratolino, *Larix europaea*, July, aptera vivipara.]
[*Panimerus laricis* (Walker) Theobald, 1929 : 135–139, partim, the alatae viviparae and alate males. Misidentification.]
[*Cinara taeniata* (Koch) Braun, 1938 : 479, partim. Misidentification.]
Cinara laricicola Börner, 1939 : 75. [Types, Deutsches Entomologisches Institut. GERMANY: Böhmen & Ostmark, *Larix*]; Stroyan, 1955 : 331 (nec *Lachnus laricicolus* Matsumura, 1917).
Cinara (*Cinarella*) *laricicola* Börner, Börner, 1949 : 59 (*Cinarella* Börner, 1949, nec *Cinarella* Hille Ris Lambers, 1948).
Cinara (*Cinarellia*) *laricicola* Börner, Börner, 1952 : 41; Pašek, 1954 : 250–253.
Cinara boerneri Hille Ris Lambers, 1956 : 246. [Nom. n. pro *Cinara laricicola* Börner, 1939, nec Matsumura, 1917]; Stroyan, 1957 : 354–355; Szelegiewicz, 1962 : 80.
Cinara (*Cinarellia*) *boerneri* Hille Ris Lambers, Heinze, 1962 : 154, 156; Pintera, 1966 : 318–319.

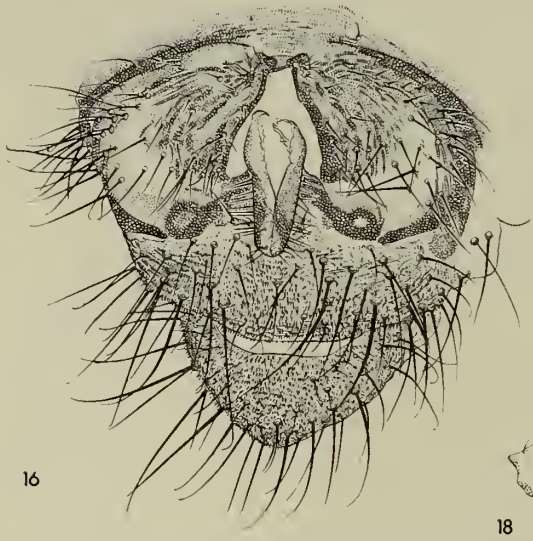
MATERIAL EXAMINED.

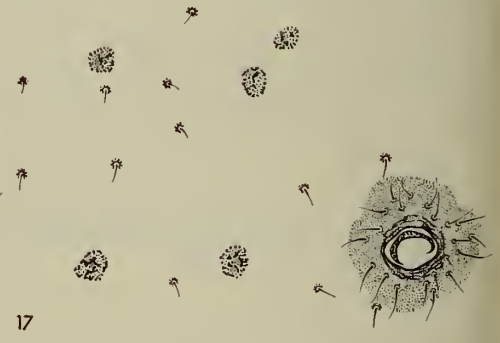
ENGLAND: Devon, Exeter, *Larix*, 14.ix.1965, 1 aptera (*H. G. Morgan* & colln.); Dorset, Weymouth, Mt Edge, 17.x.1894, 2 alate males (*Bignell*); three other alate males mounted on individual slides in the Buckton collection bear the following data, 'Weymouth, October, Bignell', slide 348; 'Weymouth, larch, September', slide 349; 'Weycombe [Surrey], Sept.', slide 350, and probably belong to the same series as the previous two males. Buckton (1881 : 53) records rearing winged forms, presumably at his home, Weycombe, Surrey, from nymphs collected by Bignell at Weymouth, Dorset. Hants, Alice Holt Lodge, *Larix*, 7.ix.1962, 3 apterae (*C. I. Carter*), Forest Research Station colln. Berks, Tubney, *Larix decidua*, 28.vi.1956, 3 apt., 1 al. (*H. L. G. Strovan* & colln.). Surrey, Kew Gardens, *Larix*

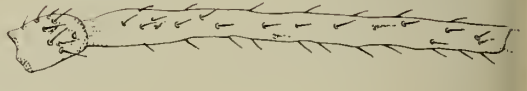
decidua, 25.vii.1964, 1 apt.; 13.viii.1961, 3 apt.; 9.ix.1962, 7 apt.; 22.ix.1962, 6 apt.; 14.x.1961, 1 ovipara; 26.x.1968, 1 ovipara (*V.F.E.*); Fernhurst, *Larix*











FIGS 14–18. *Cinara boereri*. 14–16, male genitalia, × 135. 17 & 18, aptera vivipara. 17, right siphunculus and part of fifth abdominal tergite, × 87. 18, second and third antennal segments, × 87.

decidua, 11.vii.1967, 1 apt., 1 alatoid nymph (*V.F.E.*); Richmond Park, *Larix*, 7.vii.1968, 1 apt. (*V.F.E.*); Wisley, R.H.S. gardens, 11.ix.1966, 1 apt. (*K. M. Harris & V.F.E.*); Kent, Wye, vagrant, June 1928, 1 al. (*F. V. Theobald*); London, Southgate, larch, 11.ix.1847, 1 apt. (*F. Walker*, 497); 2.ix.1847, 1 larva (495); 28.vii.1847, 1 al. (*F. Walker*, 499). Middlesex, Moor Park, *Larix decidua*, 15.vii.1962, 1 al. & larvae; 17.viii.1952, 1 apt. (*V.F.E.*). Herts, Harpenden, Rothamsted Experimental Station tower, 9.vi.1968, 1 al. (*N. R. Maslen*), Forestry Commission colln. Cambridge, Botanical Garden, *Larix decidua*, 10.vi.1952, 2 apt., 1 alatoid nymph (*V.F.E.*); 12.x.1950, 2 alate ♂♂ (*H. L. G. Stroyan* & colln.); *Larix dahurica* var. *pendula*, 15.viii.1951, 11 apt.; *L. sibirica*, 15.viii.1951, 1 apt., *L. dahurica*, 11.ix.1952, 3 apt.; *L. laricina*, 10.x.1950, 2 apt. (*V.F.E.*). Suffolk, Bury St Edmunds, Broom's Barn Expt. Stn, 29.vi.1968, 1 al. (*N. R. Maslen*), Forestry Commission colln. Yorks, Malton, High Mowthorpe Experimental Station, 30.vi.1968, 1 al.; 12.viii.1968, 1 al. (*N. R. Maslen*), Forestry Commission colln. Lancs, Meathorp Wood, larch, 5.ix.1966, 3 young larvae (*E. J. White*). Westmorland, Windermere, larch, 12.viii.1913, 2 ovip.; 16.viii.1913, 1 ♂ (*F. V. Theobald*). SCOTLAND: Edinburgh, Bush nursery, *Larix* grafts, 22.xi.1962, 1 al. ♂ (*C. I. Carter*, Forestry Comm. colln.).

AUSTRIA: Glochner, *Larix europaea*, 1.viii.1943, 1 apt. (*V. Pašek*). CZECHOSLOVAKIA: Banska Stiavnica, *L. decidua*, 20.viii.1951, 3 apt.; 4.ix.1949, 3 apt.; Polana, *L. decidua*, 20.vii.1951, 2 apt. (*V. Pašek*). 'Conifer' without further data, 1 apt., Theobald colln. GERMANY: Berlin Dahlem, *L. decidua*, 8.vii.1950, 1 apt., W. Quednau colln. (*K. Heinze*). ITALY: Zuel, nr. Cortina, *Larix*, 30.vii.1969, 5 apt., 1 al. (*V.F.E.*). NETHERLANDS: Bennekom, *L. decidua*, 15.x.1946, 1 apt. vivipara, 7 oviparae, 5 alate males (*D. Hille Ris Lambers* & colln.).

HOST-PLANTS. Specimens have been seen from *L. decidua* (= *europaea*), *L. gmelini* (= *dahurica*), *L. laricina* and *L. sibirica* and are also recorded from *Larix leptolepis*.

DISTRIBUTION. Specimens have been seen from Austria, Czechoslovakia, England, Germany, Italy, Netherlands and Scotland and have also been recorded from Bulgaria (Tashev, 1961 : 157), Latvia (Rupais, 1961 : 13–14), Mongolia (Szelegiewicz, 1963*b* : 113), Poland, Sweden, Switzerland, Ukraine and with a query from Yugoslavia (Rihar, 1963 : 264).

BIOLOGY. In England apterae viviparae have been collected in June, July and September, alatae viviparae from June 30th to August 12th, oviparae and alate males in October. Saeman (1966 : 379) gives an account of the biology. Alate males have been recorded from June to early August but have only been found in October and November in Britain. Attended by *Formica rufa* (according to Weis (1955 : 472) and by other ants (Pintera, 1966 : 319) in the wild but surviving in botanical gardens without ant attendance or with only occasional visits from *Lasius niger*.

NOTES. Closely related to *Cinara laricicola* (Matsumura) from Japan and to *C. laricifex* (Fitch) from America according to Hille Ris Lambers in Inouye (1962 : 152). Börner (1952 : 42) lists *Lachniella laricis cuneomaculata* Del Guercio, 1909, as a synonym of *C. kochiana* but the length of the tibiae agree better with *C. boerneri*. Important in apiculture in Central Europe, according to Börner & Franz (1956 : 29).

Cinara bogdanowi (Mordwilko)

? *Lachnus pruinosus* Hartig, 1841 : 368. [No types. GERMANY: Berlin], see Stroyan, 1957 : 349.
[*Aphis abietis* Walker, 1848 : 100, partim, 1 alata (see Doncaster, 1961 : 13).]
[*Aphis laricis* Walker, 1848 : 102, partim, 1st variety (see Doncaster, 1961 : 92).]
Lachnus bogdanowi Mordwilko, 1895*a* : 75, 79, 83, 94, 97–98. [Types unknown. Locality not given, presumably POLAND]; 1895*b* : 97, 115–118; Cholodkovsky, 1896*a* : 150; 1898*a* : 657–659; 1902 : 6.
Lachnus piceicola var. *viridescens* Cholodkovsky, 1896 : 509. [Types unknown. Locality not given, presumably U.S.S.R.]; 1898 : 662.
Neochmosis abietis (Walker) Theobald, 1929 : 362–354, partim.
Dilachnus radicicolus Wellenstein, 1930 : 739–743, 751. [Types unknown. Locality not given, presumably GERMANY.]
Cinara bogdanowi (Mordwilko) Börner, 1932 : 568; Braun, 1938 : 479; Szelegiewicz, 1962 : 79–80; Shaposhnikov, 1964 : 521; Pintera, 1966 : 309–311.
Cinara radicicola (Wellenstein) Börner, 1932 : 570.
Cinaropsis (*Pityaria*) *pruinosa* (Hartig) Börner, 1949 : 59; 1952 : 43.
Cinaropsis viridescens (Cholodkovsky) Börner, 1952 : 43.
Cinaria intermedia Pašek, 1952 : 96, nomen nudum; 1953 : 4–6. [Lectotype, Academy of Science, Prague. CZECHOSLOVAKIA]; 1954 : 153–155. **Syn. n.**
Cinaria borealis (Curtis) Pašek, 1953*c* : 225–226; 1954 : 216–218.
? *Cinaria* (*Mecinaria*) *radicicola* (Wellenstein) Aizenberg, 1956 : 139.
Cinara (*Cinaropsis*) *bogdanowi* (Mordwilko) Stroyan, 1957 : 349–351.
Cinaropsis (*Pityaria*) *bogdanowi* (Mordwilko) Heinze, 1962 : 168–169.
Cinara borealis (Curtis) Pintera, 1966 : 307–308.
Cinara (*Pityaria*) *bogdanowi* (Mordwilko) Canakçioglu, 1966 : 140.

MATERIAL EXAMINED.

ENGLAND: London, Southgate, Spruce, 3.vii.1847, 1 alata (*F. Walker*) (slide no. 7B); larch, 2.i.1847, 3 apterae (*F. Walker*) (496); 11.ix.1847, 4 apt. (*F. Walker*) (slide no. 497). Surrey, Wisley, *Picea schrenkiana*, 6.viii.1953, 1 apt. (*J. P. Doncaster*). Hants, Alice Holt, light trap, 4.vi.1964, 1 al., Forestry Commission colln.

BELGIUM: Jupille, *Picea excelsa*, 11.v.1961, 8 alatae (*J. Leclerq* coll.), H. L. G. Stroyan leg. CZECHOSLOVAKIA: Jakubov, *Picea excelsa*, 18.v.1950, 2 apterae, Gelnica, *P. excelsa*, 17.vi.1952, 2 apt., *P. excelsa* roots, 30.ix.1950, 2 apt., Ruské Peklany, *Picea excelsa*, 23.vi.1952, 2 apt., Bianska Stiavnica, *P. excelsa*, 22.vii.1952, 2 apt., Vysoká, *P. excelsa* roots, 16.ix.1952, 2 apt. (*V. Pašek*); Kotlina, 18.vi.1932, 1 al. (*D. Aubertin*) (*C. borealis* (Curtis) of Pasek). GERMANY; Moor, Fichten, 27.v.1934, 2 apt., (*Rebeler* coll.), K. Heinze leg. Oberhof, *P. excelsa*, 1.x.1937, 1 ovipara (*K. Heinze*). NETHERLANDS: Hoenderloo, *Picea*, 70.vi.1946, 6 oviparae (*Elton* coll.), D.H.R.L. leg.; Bennekom, *P. alba*, 1.x.1946, 4 oviparae, D.H.R.L. 2 colln. POLAND: Bydgoszoz Jachcice, *P. excelsa*, 4.viii.1956, 1 larva (*H. Szelegiewicz*). Without data, ? Poland, 3 apt., 1 alatoid nymph, ex. coll. Mordwilko. TURKEY: Artrim, Kurukürün, 1940 m., *Picea orientalis*, 1 apt.; Istanbul, Maslak, 100 m, *P. abies*, 2 larvae, 20.vi.1964 (*H. Szelegiewicz*).

HOST-PLANTS. Seen from *Picea abies* (= *excelsa*) and more rarely from other members of *Eupicea* such as *P. orientalis* and *P. schrenkiana* (= *tianshanica*) and also recorded from *P. glauca*.

DISTRIBUTION. Seen from Belgium, Czechoslovakia, England, Germany, Netherlands, Poland, and Turkey. Also recorded from Austria, Bulgaria, Norway, Ukraine, Moldavia, Latvia and Estonia.

BIOLOGY. Occurs on both the branches and the roots of spruce. Alatae viviparae occur from May until early July. Oviparae occur in October. According to Pintera (1966 : 311) the spring generations live on the two year old or older twigs in shady positions and alatae are produced in the third generation. The progeny of the alatae develop on the roots or at the base of the trunk. *Cinara bogdanowi* is attended by ants which construct special chambers around the roots for the aphids. Mating occurs after the sexuales have left the subterranean shelters and the oviparae lay eggs on the bark of the younger twigs. Wellenstein (1930 : 739–743) describes the oviparae and alate males as *Lachnus radicicolus*. Anholocyclic overwintering on the roots has been recorded.

NOTES. Said to be important for the production of 'forest honey' in Central Europe (Pintera, 1966 : 311). Inouye (1970 : 73–74) regards the Japanese *Cinara ezoana* Inouye, 1936, as a subspecies of *C. bogdanowi*.

Cinara brauni Börner

(Text-fig. 19)

? *Eulachnus nigrofasciatus* Del Guercio, 1909 : 316, 324–326. [Types unknown. ITALY: Firenze, *Pinus sylvestris*, 1905.]

Cinara brauni Börner, 1940 : 1. [Types, Deutsches Entomologisches Institut. Central Europe, *Pinus austriaca*]; Szelegiewicz, 1962 : 80; Tashev, 1964 : 172–173; Pintera, 1966 : 290, 291; Maslen, 1969 : 228.

Cinara (*Subcinara*) *brauni* Börner; Börner, 1949 : 59; 1952 : 41; Pašek, 1954 : 175–179.

MATERIAL EXAMINED.

ENGLAND: Hants, Alice Holt Gardens, suction trap, 20.vii.1968, 1 alata (*N. R. Maslen*), Forestry Commission collection.

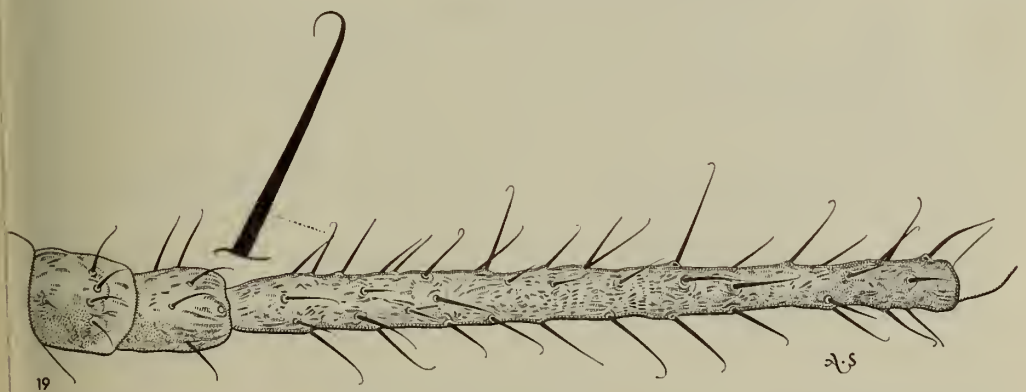


FIG. 19. *Cinara brauni*, aptera vivipara. Antennal segments I–III, × 150.

AUSTRIA: Wien-Schwechat, *Pinus nigra*, 7.ix.1970, 4 apt. (*W. Quednau*). CZECHOSLOVAKIA: Banska Stiavnika, *P. nigra*, 7.vii.1952, 3 apterae, 1 al.; Detra, *P. nigra*, 8.viii.1952, 2 apt., 1 al. (*V. Pašek*). HUNGARY: Bükk, Fekete-sár, *P. nigra*, 9.ix.1965, 2 apt. viviparae, 1 ovipariform apt. (*H. Szelegiewicz* & colln. 2942). NETHERLANDS: Arnhem, *Pinus austriaca*, 26.viii.1955, 2 apt. (*D. Hille Ris Lambers*). POLAND: Bydgoszez-Osied. L., *Pinus nigra*, 8.viii.1957, 3 apt., 1 al.; Wladystawowo, distr. Puck, *P. nigra*, 8.vii.1960, 3 apt., 3 al. (*H. Szelegiewicz* & colln.). TURKEY: Istanbul, Bahceköy, 110 m a.m.s.l., *P. nigra* var. *pallasiana*, 18.vii.1963, 3 apt., 1 alatoid nymph; Istanbul, Bayazit, 80 m a.m.s.l., *P. nigra*, 7.vi.1964, 1 apt., 1 al.; Bursa-Uludag, Sarialan, 1600 m a.m.s.l., *P. nigra* var. *pallasiana*, 22.viii.1965, 7 apt. (*H. Çanakçioğlu*).

HOST-PLANTS. *Pinus nigra* (= *austriaca*), *P. nigra* var. *caramatica* (= *pallasiana*) and *P. nigra* var. *maritima* (= *laricio*).

DISTRIBUTION. Specimens have been seen from Austria, Czechoslovakia, England, Hungary, Netherlands, Poland and Turkey and are also recorded from Bulgaria, Germany and the Crimea.

BIOLOGY. According to Pintera (1966 : 291) it lives on young shoots attended by the ant *Formica rufa*.

Cinara costata (Zetterstedt)

(Text-fig. 20)

Aphis costata Zetterstedt, 1828 : 559. [Types, Entomologische Museum Lund, teste Wahlgren, 1939 : 3–4, Lappland]; 1840 : 311; Walker, 1848 : 100–102; 1852 : 957.

? *Cinara symphyti* Curtis, 1835 : no. 577, page 2. [Types unknown. ENGLAND: June, alatae] (see Walker, 1852 : 957; Hottes, 1949 : 159).

Lachnus costatus Hartig, 1839 : 645 (new species). [Types unknown. No locality, presumably GERMANY.]

Schizoneura costata (Hartig) Hartig, 1841 : 367; Walker, 1852 : 1050.

[*Lachnus fasciatus* Burmeister; Kaltenbach, 1843 : 160–161; Koch, 1856 : 237–238; Swain, 1921 : 211–212. Misidentifications.]

Dryobius cistatus [sic] Walker; Buckton, 1881 : 78.

Lachnus farinosus Cholodkovsky, 1892 : 74–75. [Types unknown. Without locality, presumably RUSSIA, near Leningrad]; 1896*a* : 145–146; 1898 : 650–654; van der Goot, 1915 : 395.

[*Lachnus fasciatus* (Kaltenbach) Mordwilko, 1895*a* : 102; 1895*b* : 104, 139–146.]

[*Lachniella fasciata* (Burmeister) Del Guercio, 1909 : 294–296, partim ?, alata only. Misidentification.]

Lachnus costatus (Zetterstedt) Jackson, 1919 : 164; Theobald, 1929 : 157–161.

[*Panimerus pinihabitans* (Mordwilko) Theobald, 1929 : 132–135 partim, the apterae from Windermere. Misidentification.]

Pterochlorus cistatus [sic] (Walker) Buckton; Swain, 1921 : 211.

Lachniella costata (Zetterstedt) Börner, 1932 : 571; 1952 : 45; Braun, 1938 : 482; Wahlgren, 1939 : 3–4; Pašek, 1954 : 195–197; Heinze, 1962 : 176–178; Higuchi & Miyazaki, 1969 : 31.

Cinara costata (Zetterstedt) Mordwilko, 1933 : 159; 1948 : 201; Inouye, 1937 : 105; Klott, Kunkel & Ehrard, 1960 : 166–167; Hottes, 1961 : 41, 43; Szelegiewicz, 1962 : 81; Shaposhnikov, 1964 : 522; Pintera, 1966 : 311–314.

Cinara (*Lachniella*) *costata* (Zetterstedt) Eastop, 1966 : 528–529.

Cinara (*Cinaropsis*) *costata* (Zetterstedt) Inouye, 1970 : 84–85.

MATERIAL STUDIED.

ENGLAND: without further data, 1 alata (*F. Walker*), slide no. 266. London, Southgate, spruce, 5.vi.1847, 1 aptera, 2 alatoid nymphs (*F. Walker*), slide 677; 21.vi.1847, 1 al. (no. 269); 25.vi.1847, 2 al. & 1 immature (270, 271); 30.vi.1847, 4 apt., 1 al. (272); 3.vii.1847, 1 apt., 2 al. (276); 30.x.1847, 7 oviparae (274, 275, 277); 'scotch pine', 9. vi.1847, 1 al. (273); 'scotch fir', 18.vi.1847, 1 apt., 2 al. (*F. Walker*), slide no. 273. Kent, Wye, spruce, 5.vii.1913, 9 apt.; 19.v.1927, 13 apt.; '*Pinus sylvestris*', 5.v.1913, 1 apt., 3 alatoid nymphs (*F. V. Theobald*), the correct data for this sample is probably 'spruce' 27.v.1913, see data for *Cinara pinea* from Wye in May, 1913 on page 157. Herts, Redbourne, *Picea abies*, 13.v.1945, 4 apt., 4 al.; *Picea* sp., 13.v.1945, 8 apt., 4 al. (*J. P. Doncaster*). Harpenden, Rothamsted tower trap, 9.vi.1968, 1 al., Forestry Commission colln. Berks, Midgham, *Picea excelsa*, 15.v.1948, 9 apt. (*V.F.E.*). Gloucs., Cowley Manor, June 1959, 1 al. (*R. S. George*). Hants, Alice Holt, *Picea abies*, 14.vi.1967, 3 apt., 1 alatoid nymph (*H. C. Dale*). Somerset, Long Ashton, 1964, 1 al. (*A. Stringer*). Bucks, Slough, 1937, 2 apt., 2 al. (*H. Downes*). Cumberland, Great Salkeld, *Pinus sylvestris*, 20.vi.1914, 1 al. (*F. V. Theobald*), the alatoid nymph on the same slide is *Schizolachnus pineti*. Westmorland, Windermere, spruce, 5.v.1913, 3 immature (*F. V. Theobald*); 13.v.1915, 1 apt. (*R. Roberts*), F.V.T. colln.

CZECHOSLOVAKIA: Prague, flying, 2.vi.1964 (*V.F.E.*). GREENLAND: 1929, stomach of Phalarope, thorax and abdomen of 1 al. (*O. W. Richards*). NETHERLANDS: Bennekom, *Picea* sp., 21.vi.1949, 3 apt., 2 al. (*D. Hille Ris Lambers & H. L. G. Stroyan* coll.), H.L.G.S. colln. JAPAN: Hokkaido, Sapporo, Mt Soranumar, *Picea* sp., 3.vii.1964, 3 apt. (*H. Takada*). POLAND: Bydgoszcz-Jacheire, *Picea excelsa*, 4.viii.1956, 1 apt. (*H. Szelegiewicz*).

AUSTRALIA: New South Wales, Mittagong, '*Abies excelsa*', 25.ix.1959, 7 apt.; '*Picea coseana glauca*', 25.ix.1959, 3 apt. (*V.F.E.*). Tasmania, Oaklands, *Picea*, 22.v.1952, 2 larvae, Tasmania Dept. Agriculture colln. CANADA: Ontario, Ottawa, *Picea abies*, 4.vi.1951, 1 apt. (*W. R. Richards*).

FIG. 20. *Cinara costata*. Wings, × 24.

Host-plants. *Picea abies* (= *excelsa*) and also recorded (Pintera, 1966 : 312) from other *Eupicea* such as *Picea glauca*, *P. glehni* and *P. pungens* and from *P. jezoensis* in the *Cascita* group and *P. omorika* of the *Omorika* group.

Distribution. Specimens have been seen from Czechoslovakia, England, Greenland (from stomach of Phalarope), Netherlands, Japan, Poland, New South Wales, Tasmania and Ontario. *Cinara costata* has also been recorded from Austria, Finland, Germany, Norway, Scotland, Sweden, U.S.S.R., Ukraine, Latvia, Estonia, Sachalin, Yugoslavia, California (see 'Notes') and Washington.

Biology. Numerous apterae and some alatae can be collected in May in England and apterae are less common in June. Occasional apterae and alatae have been collected in July. Oviparae occur in October. *C. costata* seems not to have been collected in Britain during August or September. According to Pintera (1966 : 312–313) *C. costata* lives on the older twigs all the year and is not or only rarely attended by ants. In September, 1959 in New South Wales, it was found both on the second year twigs and on the lower branches covered with earth, apparently by ants. Cholodkovsky (1892 : 74–75) gives an account of the biology, including alate males, presumably near Leningrad.

Notes.

The type-species of *Lachniella* Del Guercio, 1909 (*as fasciata*)

Lachniella is a real species-group in the sense that there are a number of species of similar appearance with similarly pigmented wings, few rhinaria on the antennae of the alatae and oviparae with strongly swollen hind tibiae. Otherwise the species are similar to *Cinaropsis* and perhaps *Cinaropsis* should be regarded as a synonym of *Lachniella*, used as a sub-genus of *Cinara*. The confusion concerning the use of *Lachniella* resulted from *Lachnus fasciatus* Burmeister, 1835 being selected as the type-species of *Lachnus* Burmeister by Westwood, 1840, without there being agreement as to the identity of *Lachnus fasciatus*. Some authors regarded *L. fasciatus* as a synonym of *Lachnus roboris* (L.) and others as a synonym of *Lachnus costatus*.

Cinara nimbata Hottes, 1954, from North America is similar to *costata* but bears shorter and thicker hairs. It is not clear whether the record of *costata* from *Picea sitchensis* in California by Hottes & Essig (1953 : 172) really applies to *costata* or to the species subsequently described as *Cinara sitchensis* Hottes, 1958.

Cinara cupressi (Buckton)

(Text-fig. 21)

Lachnus cupressi Buckton, 1881 : 46–47. [Types BMNH. England]; Cholodkovsky, 1898 : 669–670.

Lachnus juniperinus Mordwilko, 1895*a* : 75, 79, 82, 94, 102. [Types unknown. Poland]; 1895*b* : 103–104, 134–136; Cholodkovsky, 1898 : 668–669.

Lachniella juniperinum (Mordwilko) Del Guercio, 1909 : 305–306.

Lachniella tujae Del Guercio, 1909 : 288, 309–310. [Types unknown. *Tuja* without other collection data, presumably Italy.]

? *Lachniella juniperi signata* Del Guercio, 1909 : 289, 314–315. [Types unknown. Italy, nr Firenze, *Thuja occidentalis*.]

[*Lachnus juniperi* (De Geer); Essig, 1911 : 541–543; van der Goot, 1915 : 396–399. Misidentification.]
Dilachnus cupressi (Buckton) Swain, 1921 : 212–213.
Lachnus sabinae Gillette & Palmer, 1924 : 9–11. [Types. Colorado: Fort Collins, *Sabina* (= *Juniperus*) *scopulorum*.] **Syn. n.**
Panimerus cupressi (Buckton) Theobald, 1929 : 148–149.
[*Panimerus juniperi* (De Geer) Theobald, 1929 : 151 partim, the specimens from *Juniperus virginiana* at Kew. Misidentification.]
Panimerus tujae (Del Guercio) Theobald, 1929 : 153–154.
Cinara sabinae (Gillette & Palmer) Gillette & Palmer, 1931 : 867; Palmer, 1952 : 45.
Cinara cupressi (Buckton) Börner, 1932 : 570; Braun, 1938 : 480; Hottes & Essig, 1953 : 172; Szelegiewicz, 1962 : 83.
Cinara thujae (Del Guercio) Braun, 1938 : 480.
Neochmosis cupressi (Buckton) Kloet & Hincks, 1945 : 70.
Neochmosis tujae (Del Guercio) Kloet & Hincks, 1945 : 70.
Cupressobium cupressi (Buckton) Börner, 1952 : 45.
Cinara canadensis Hottes & Bradley, 1953 : 86–87. [Type, Canadian National Collection, Ottowa: Ontario, *Juniperus virginiana*.] **Syn. n.**
Cinara (*Cupressobium*) *cupressi* (Buckton) Eastop, 1958 : 93.
Cinara juniperina (Mordwilko) Ossiannilsson, 1959 : 379.
Cupressobium juniperinum (Mordwilko) Heinze, 1962 : 174–176
[? *Cinara tujafilina* (Del Guercio); Tashev, 1944 : 173. Misidentification.]

Material studied.

England: Cornwall [Probus, cypress], 17.xi.[1879], 4 apterae (*J. T. Roscawen*) type-series of *cupressi*). Gloucs., Long Ashton, *Cupressus* sp., May–June 1937, apt. (*C. L. Walton*). Somerset, Weston-super-Mare, *Cupressus macrocarpus*,

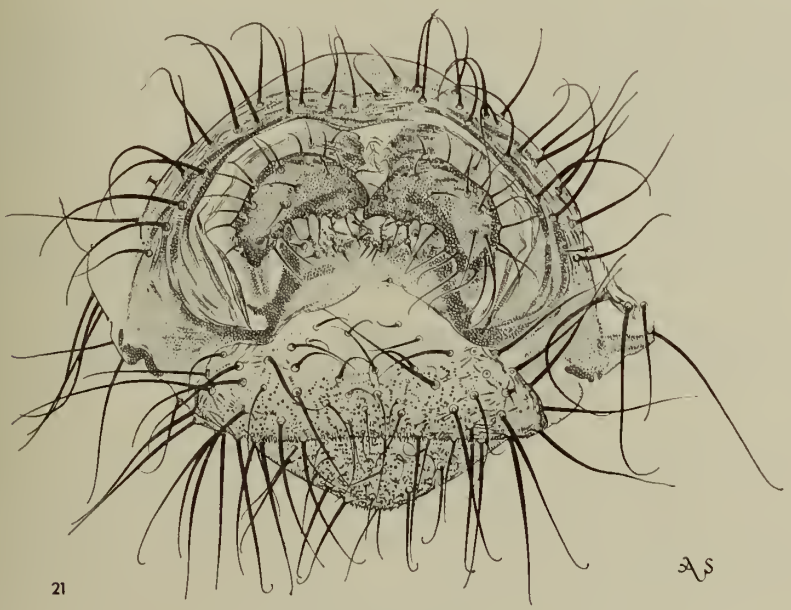


Fig. 21. *Cinara cupressi*. Male genitalia, × 000.

June 1937, 4 apt.; cypress, June 1937, 2 apt. (*C. L. Walton*); Bristol, *Thuja* sp., 7.vii.1913, 7 apt., 1 alata (*F. V. Theobald*). Surrey, Kew Gardens, *Juniperus virginiana*, 23.viii.1919, 4 apt. (*F. Laing*); Wimbledon, *Thuja* sp., 5.vi.1935, 2 apt. (*C. T. Gimingham*); Wisley, *Cupressus macrocarpus*, 20.ix.1923, 17 apt. (*F. V. Theobald*). Berks, Reading, *C. macrocarpus*, 16.vi.1957, 5 apt., 1 al., Eastwood's nursery; *Cupressus* sp., 3.vi.1950, 1 apt. (*V.F.E.*); Ascot, Silwood Park, 40′ suction trap, 10.viii.1968, 1 al., Forestry Commission Colln. Bucks, Slough, R.C.S. Research Station, cypress, June 1937, 2 apt., 3 al. (*Downes*). Kent, Bedgebury Pinetum, *Juniperus chinensis*, 8.vii.1969, 1 al.; Wye College, suction trap, 6.viii.1969, 1 al. (*N. R. Maslen*).

Czechoslovakia: Bianska Stiavnica, *Biota orientalis*, 9.v.1950, 1 apt. (*V. Pašek*). Germany: Bad Zwischenghr, *Juniperus virginiana*, 12.v.1959, 2 ? fundatrices (*Gunkel* coll.), K. Heinze leg. Friedhof, *Thuja occidentalis*, 31.x.1957, 1 ovipara (*K. Heinze*). Berlin, *T. occidentalis*, October 1953, 6 ovip., 1 alate male (*D.E.J.*), D. Hille Ris Lambers colln. Netherlands: Nalkenburg Z. l., *T. occidentalis*, 7.v.1930, 1 apt. (*D.H.R.L.*); Wageningen, *Thuja occidentalis ohlendorffi*, 19.vi.1954, 29 apt., 5 al. (*D.H.R.L. & J. P. Doncaster*). *T. occidentalis*, 2 ovip., 2 al. males, October, 1940 (*D.H.R.L.*). Poland: Olsztyn, *T. occidentalis*, 18 apt. (*S. Huculak*). Turkey: Bacekoy, Istanbul, *Cupressus goveniana*, 10.iii.1966, 7 apt. (*H. Çanakçioğlu*).

Canada: British Columbia, Kelowna, *Juniperus scopulorum*, 5.vi.1962, 1 apt. (*G. A. Bradley*). U.S.A.: Penn., Waddle, The Rock, *Juniperus virginiana*, 13.vi.1965, 4 apt., 1 al.; 7.ix.1964, 3 apt. (*J. O. Pepper*).

Host-plants. *Thuja occidentalis, Cupressus goveniana, C. macrocarpa, Juniperus virginiana* and occasionally *Juniperus scopulorum* and *Thuja orientalis*.

Distribution. Specimens have been seen from Czechoslovakia, England, Germany, Netherlands, Poland, Turkey, British Columbia and Pennsylvania, and are also recorded from Iraq, Italy, Latvia, Sweden, Ukraine and Ontario (original description of *canadensis*).

Biology. Apterae viviparae live on the aerial parts of the hosts from May to September and were described from November in Cornwall where the winter is mild. Alatae viviparae are produced between mid June and mid August and oviparae and alate males in October. Gunkel (1963*a* : 1–48 & 1963*b* : 329–341) has given an account of the natural enemies and population dynamics of *Cinara cupressi*.

Notes. Takahashi's record (1941 : 150) of *C. cupressi* from *Cupressus torulosa* in Victoria was most probably based on specimens of *Cinara fresai*. *Lachnus juniperinus* seems to be a synonym of *Cinara cupressi* but Eastop (1966 : 528) and perhaps Braun (1938 : 480) applied the name *Cinara juniperina* (Mordwilko) to *C. fresai*.

The apparently discontinuous host-plant preferences have led to a number of synonyms. Specimens from *Juniperus virginiana* have been described as *Cinara canadensis* and from *J. scopulorum* as *Cinara sabinae*.

Much of the description of *Cinara difficilis* Hottes & Frison, 1931, from *Juniperus virginiana*, agrees with *C. cupressi* but the hairs on the body and appendages of *difficilis* are shorter than in *cupressi* and the ultimate rostral segment of *difficilis* bears about 20 accessory hairs distributed over both surfaces.

Cinara escherichi (Börner)

[*Lachnus nudus* (De Geer) Mordwilko, 1895*a* : 78, 79, 81, 82, 99; 1895*b* : 100, 119–124; Cholodkovsky, 1898 : 635, 642–643. Misidentifications.]
? *Lachniella picta* Del Guercio, 1909 : 293–294. [Types unknown. ITALY: Monte Boni, *Pinus sylvestris*, 27.v.1905, aptera.]
Cinara nuda (Mordwilko) Hottes, 1930 : 186–187; Pintera, 1966 : 314.
Cinaria escherichi Börner, 1950 : 2. [Types Deutsches Entomologisches Institut. AUSTRIA: Burgenland]; 1952 : 43; Pašek, 1954 : 148, 149–151; Heinze, 1962 : 162.
Cinara escherichi (Börner) Kloft, Kunkel & Ehrhardt, 1960 : 165; Szelegiewicz, 1962*a* : 81.

MATERIAL STUDIED.

ENGLAND: Hants, Alice Holt, suction trap, 24.vi.1967, 1 alata (*C. I. Carter & N. R. Maslen*), Forestry Commission colln.

CZECHOSLOVAKIA: Jakubov, *Pinus sylvestris*, 19.i.1950, 2 fundatrices; Banska Stiavnica, *P. sylvestris*, 10.v.1950, 1 aptera; 7.vi.1952, 2 al.; 3.viii.1952, 2 apt. (*V. Pašek*). POLAND: Bydgoszcz-Jachcice, *Pinus sylvestris*, 12.viii.1957, 3 apt., 3 al.; Stamirowice distr., Grojec, *P. sylvestris*, 18.viii.1961, 4 apt. (*H. Szelegiewicz* & colln.).

HOST-PLANT. *Pinus sylvestris*.

DISTRIBUTION. Originally described from Austria, specimens have been seen from Czechoslovakia, England and Poland, and have also been recorded from Germany.

BIOLOGY. According to Pintera (1966 : 314) *Cinara escherichi* lives in large colonies on the trunk or basal parts of the older branches in the spring and in rather smaller colonies or individually under the bark during the summer. The colonies are attended by ants.

NOTES. *Cinara escherichi* is a member of the '*pini*-group', generally similar to *C. acutirostris* but bears more numerous but shorter hairs. Authors after Mordwilko, 1895, and before Szelegiewicz, 1962, who refer to *Cinara nuda*, were applying the name to *C. pini* (L.) or to one of its subspecies. *Cinara canatra* Hottes & Bradley from *Pinus banksiana* in North America is similar to *C. escherichi* except for the pigmented dorsum of *C. canatra* and that the second antennal segment of the summer apterae viviparae of *C. escherichi* bear 9–13 hairs, while the second antennal segments of *C. canatra* bear 5–10 hairs. The eighth abdominal tergite of *C. canatra* bears 10–14 hairs while the eighth tergite of the summer apterae of *C. escherichi* bears 14–23 hairs.

Cinara fresai Blanchard

[? *Cinara juniperina* (Mordwilko) Braun, 1938 : 480. Misidentification.]
Cinara fresai Blanchard, 1939 : 860–862. [Types Instituto de Sanidad Vegetal, Buenos Aires; ARGENTINA: Tandil, *Cupressus macrocarpa*, alata.]
[*Cinara cupressi* (Buckton); Takahashi, 1941 : 150. Misidentification.]
Cinara wacasassae (Tissot, 1945 : 49–52. [Types Florida Agricultural Experiment Station Gainsville; U.S.A.: Florida.] **Syn. n.**
[*Cinara juniperi* (De Geer); Cottier, 1953 : 77–81. Misidentification.]
? *Cupressobium mordwilkoi* Pašek, 1954 : 306–309; Heinze, 1962 : 174.
[*Cinara* (*Cupressobium*) *cupressi* ? *juniperina* (Mordwilko) Eastop, 1961 : 75. Misidentification.]
? *Cinara mordwilkoi* (Pasek) Szelegiewicz, 1962 : 84.
? *Cinara* (*Cupressobium*) *mordwilkoi* (Pašek) Shaposhnikov, 1964 : 524.
Cinara maui Bradley, 1965 : 668–670. [Types Forest Entomology Laboratory, Winnipeg; HAWAII: *Cryptomeria japonica*, apterae.] **Syn. n.**
[*Cinara* (*Cupressobium*) *juniperina* (Mordwilko) Eastop, 1966 : 528; Mound, 1969 : 62. Misidentification.]

MATERIAL STUDIED.

ENGLAND: Surrey, Farnham, Alice Holt Research Station, *Juniperus sabina* var. *tamariskifolia*, 25.vi.1956, 2 apterae and alatoid nymph (*D. Bevan* coll.), via C. I. Carter. Ham, *Juniperus horizontalis*, 2–31.x.1966, 27 apt., 3 alatae (*L. A. Mound*).

AUSTRALIA: New South Wales, Wentworth Falls, *Cupressus arizonica*, 30.i.1958, 8 apt. (*K. M. Moore*) (4 in N.S.W. Forestry Dept. colln.); Elizabeth Bay, *Cupressus* sp., 21.i.1963, 12 apt. (*Webster* coll.), via K. M. Moore; Collaroy, *Cupressus brunniana*, 8.vi.1962 (*G. P. Wright* coll.), via K. M. Moore; Mittagong, *Cupressus torulosa*, 25.ix.1959, 2 alatae and one first instar larva (*V.F.E.*). A.C.T., Canberra, flying, 22.viii–12.ix.1959, 3 al.;? *Cupressus* sp., 1–5.ix.1959, 4 apt., 3 al., *Cupressus sabina*, 3–10.ix.1959, 5 apt., 7 al.; 3.x.1959, 2 apt. & alatoid nymphs. *Juniperus* sp., 6.ix.1959, 6 al., 6 larvae. 'Juniper or cypress', 3.ix.1959, 3 apt. *Cupressus* sp., 16.xi.1959, 8 apt. (*D. Goodchild*) (4 apt. in C.S.I.R.O. colln.). Tasmania, Claremond, cypress, 12.viii.1957, 2 apt., 3 al.; Margate, *Cupressus macrocarpa*, 23.xii.1964, 5 apt. (*E. J. Martyn*). Victoria, Melbourne, Brighton Beach, *Cupressus* sp., 2.v.1959, 13 apt., 2 al. (4 apt. now in colln. A. Pintera); 21–25.vi.1959, 6 apt., Melbourne, *Cupressus lambertiana*, near ends of twigs, 26.v.1959, 3 apt. ? *Cupressus*, 8.vii.1959, 4 apt. (*V.F.E.*). Maffra, Mt. Lithgow, 14.iv.1938, 2 apt., Victoria Dept. Agric.

CHILE: Plazoleta Yungue, Mas A Tierra, Islas Juan Fernadez, *Cupressus* sp., 7.iii.1968, 2 apt. (*C. W. O'Brien* coll., leg. & 1 in colln A. G. Robinson).

U.S.A.: California, Berkeley, *Juniperus* ? *scopulorum*, 23.iii.1964, 1 apt., 3 al. (*V.F.E.*). San Diego, *Juniperus* sp., 30.iii.1964, 2 al. & larvae (*R. C. Dickson, O. Heie & V.F.E.*). Florida, St Augustine, *Juniperus silicicola*, 19.iv.1945, 1 apt., 1 al. (*A. N. Tissot*) (metatypes of *C. wacasassae*). Oregon, Portland, meyer juniper, 8.i.1963, 2 apt. (*F. P. Larson* coll.), G. F. Knowlton leg.

HOST-PLANTS. *Juniperus horizontalis, J. sabina, J. silicicola* and more rarely *J. chinensis, J. scopulorum* and *J. squamata*; *Cupressus macrocarpa, C. torulosa* and more rarely *C. arizonica*, and recorded from *Cryptomeria japonica* as *Cinara maui*.

DISTRIBUTION. Specimens have been seen from England, New South Wales, Tasmania, Victoria, Chile, California, Florida and Oregon and have also been recorded from New Zealand.

BIOLOGY. Alatae viviparae have been found in both June and October in England. Sexuales are unknown, unless *Cinara mordwilkoi* is a synonym. An aphid of sporadic appearance, it was common in Melbourne, Victoria from May to July 1959 and at Canberra, A.C.T. from August to December 1959, but has apparently not been common there since (R. D. Hughes, personal communication). *Cinara fresai* lives under the older branches with ants and alatae viviparae are produced in large colonies.

NOTES. Braun (1938 : 480) keys out *Cinara juniperina* as having a body-length of more than 3 mm, the fifth antennal segment as long as the sixth and living on *Juniperus*. He does not give locality data. Pašek's (1954 : 306–309) description of *Cinara mordwilkoi* may also apply to *Cinara fresai* but it is not likely since Pintera and Szelegiewicz found mostly oviparae while *fresai* is known only from viviparae. If *C. mordwilkoi* is distinct from *fresai*, then Braun's (1938) record of *juniperina* probably applies to *mordwilkoi*. Schouteden (1906 : 203) records *Lachnus* ? *juniperinus* from *Juniperus communis* in Belgium. The first European specimens seen during this study were collected in 1956.

Cinara fresai is almost unique in *Cinara* in that the radial sector of the fore wing often does not reach the wing apex; this character is well illustrated in the original description. In occasional specimens of *C. fresai* the radial sector does reach the wing apex in the typical *Cinara* manner and in occasional specimens of *C. tujafilina* the radial sector does not quite reach the wing apex.

Cinara juniperi (De Geer)

Aphis juniperi De Geer, 1773 : 56–58. [Types unknown. Locality not given]; 1780 : 38; 1783 : 77; Fabricius, 1781 : 388; 1794 : 218.
Lachnus juniperi (De Geer) Kaltenbach, 1843 : 153–154; Koch, 1856 : 243–244; Mordwilko, 1895*a* : 101; 1895*b* : 103, 136–139; Cholodkovsky, 1898 : 667–668; 1902 : 7.
Lachniella juniperi (F.) Del Guercio, 1900 : 108; 1909 : 312–314; Jackson, 1919 : 164.
Dilachnus juniperi (De Geer) Swain, 1921 : 213.
Cinara juniperi (De Geer) Börner, 1932 : 57; Mordwilko, 1933 : 169; Mimeur, 1936*b* : 253; Braun, 1938 : 480; Hottes, 1955 : 103; Szelegiewicz, 1962 : 82.
Neochmosis juniperi (De Geer) Kloet & Hinks, 1945 : 70.
Cupressobium juniperi (De Geer) Börner, 1952 : 44; Pašek, 1954 : 304, 305–306; Heinze, 1962 : 174.
Cinara (*Cupressobium*) *juniperi* (De Geer) Eastop, 1958 : 93; Shaposhnikov, 1964 : 524.
[? *Cinara mordwilkoi* (Pašek) Szelegiewicz, 1962 : 84. Misidentification.]

MATERIAL STUDIED.

ENGLAND: London, Southgate, juniper, 4.vi.1847, 7 apterae, 4 alatae (*F. Walker*)

(slide nos. 459 & 560); 25.vi.1847, 7 apt., 1 al. (461); 21.viii.1847, 2 apt. (463); 30.x.1847, 3 apt. (*F. Walker*), 462. Kent, Wye, juniper, May 1913, 3 al., June 1913, 1 apt. (*F. V. Theobald*). From *Juniperus communis*, Trottiscliffe Park, August, 1968, 1 apt.; Crookhorn Wood, November 1968, 2 apt.; Shoreham, White Hill, January 1969, 1 apt. (*L. K. Ward*). Surrey, Wisley, *Juniperus communis*, 30.vii.1953, 11 apt. (*J. P. Doncaster*); *J. communis effusa*, 22.v.1968, alatoid nymphs (*K. M. Harris*); *J. communis hibernica*, 14.v.1968, 11 apt., 2 al. & many alatoid nymphs; *J. communis nana*, 22.v.1968, 1 al. & alatoid nymph; *J. chinensis kewensis*, 22.v.1968, 5 alatoid nymphs, 4.ii.1969, 9 apt. (*K. M. Harris*). Kew Gardens, *J. chinensis*, 26.ix.1960, 7 apt. (*V.F.E.*). Wimbledon, 'sallow catkins', 16.v.1930, 1 al. (*C. N. Hawkins*); Mickleham Down, juniper, 2.vi.1925, 3 apt. (*F. Laing*). Mickleham Common, juniper, 26.xi.1922 (*W. E. China*). From *Juniperus communis*, Riddlesdown, 7.vi.1968, 2 al.; January 1969, 2 apt. Newlands Corner, July 1968, 1 apt. Walton Down, August 1968, 2 apt.; January 1969, 1 apt.; Park Down, October 1968, 1 apt.; Hackhurst Down, January 1969, 5 apt. (*L. K. Ward*). Berks, Streatly, Green Hill, *J. communis*, July 1969, 2 apt. (parasitized); October 1969, 2 apt. (parasitized); Hogtrough Bottom, *J. communis*, April 1969, 2 apt.; May 1969, 3 al.; July 1969, 1 apt. (parasitized) (*L. K. Ward*). Oxon, Ewelme Park, May 1969, 1 al.; Ewelme Down, July 1969, 2 apt. (parasitized); September 1969, 2 apt.; Aston, Rowant, July 1969, 2 apt.; Nuffield Common, June 1969, 1 apt., 1 al.; July 1969, 1 apt.; Peppard Common, April 1969, 1 apt.; July 1969, 2 apt. (parasitized); October 1969, 2 apt.; Bix Bottom, July 1969, 1 apt. (*L. K. Ward*). Bucks, *J. communis*, Bledlow, 25.ix.1919, 2 apt. (*F. Laing*). Whiteleaf, 5.viii.1951, 2 apt. (*V.F.E.*). High Wycombe Hill, May 1969, 1 al.; West Wycombe Hill, April 1969, 5 apt., 1 brachyptera; May 1969, 3 apt., 3 al. (*L. K. Ward*). Herts, Harpenden, Rothamsted trap F.1, 22.v.1943, 1 al. (*J. P. Doncaster*). Rothamsted tower trap, 31.v.1968, 1 al., Forestry Commission colln. From *Juniperus communis*, Aldbury, 11.viii.1944, 4 apt. (*J.P.D.*); Aldbury Hill, July 1969, 4 apt. (*L. Ward*); Gustard Wood nr. Harpenden, 30.iv.1957, 4 apt. (*H. L. G. Stroyan* & colln.); Albury Hill, October 1969, 1 apt.; Commonwood Common, May 1969, 2 apt., 4 al. (*L. K. Ward*). Cambridge, *Juniperis communis*, University botanical garden, 9.v.1952, 16 apt., 21.vi.1951, 1 apt. (*V.F.E.*); 9.iv.1954, 1 apt. (*H.L.G.S.* & colln.). Fleam Dyke, May 1969, 3 apt., 2 al., 2 alatoid nymphs; July 1969, 3 apt.; October 1969, 3 apt. (*L. K. Ward*). Northumberland, Alnwick & Wooler, *J. communis*, May (prior to 1881), 2 al. (*Hardy*), G. B. Buckton slide no. 232. Berwick, 2 apt. (prior to 1881), G. B. Buckton, 233. Cheviott, May (prior to 1881), 2 al. (*Hardy*), G. B. Buckton, 234. SCOTLAND: Sutherland, Brora, *J. communis*, 11.v.1936, 2 apt. (*G. D. Morrison*). Perthshire, Trossachs, juniper, 28.vi.1932, 1 apt., 3 al. (*W. H. T. Tams*). Pitlochry, juniper, September 1920, 7 apt. (*F. V. Theobald*). Kincardine, Banchorry, *Juniperus*, 5.vi.1964, 8 apt., 1 alatoid nymph (*L. A. Mound*). Inverness, Juniper, July 1933, 1 apt. (*G. D. Morrison*). Nethybridge, *J. communis*, 6.viii.1940, 1 apt., 1 al. (*G. D. Morrison*). Banffshire, Mortlach, 14.vii.1938, 2 apt. (*G. D. Morrison*). Aberdeen, Glen Gairn, 17.viii.1940, 3 immature (*G. D. Morrison*). WALES: Glams., Gower Slade Cliffs, limestone, *J. communis*, 18.v.1964, 1 apt., 7 al. (*H. L. G. Stroyan* & colln.).

AZORES: Pico, N. slopes, *Juniperus oxycanus*, 9–17.vii.1929, 5 apt., 4 al. (*J. Balfour-Browne*). GUERNSEY: Couture, *Juniperus*, 11.vi.1951, 15 apt., 2 alatoid nymphs (*V.F.E.*). CZECHOSLOVAKIA: Banska Stianvika, *J. communis*, 5.v.1950, 3 fundatrices (*V. Pašek*). GERMANY: Naumberg, *J. communis*, summer 1932, 1 apt., 1 alatoid nymph; Wittental, *J. communis*, 15.vi.1961, 3 apt. (*K. Heinze*). Wildberg, (Black Forest), *J. communis*, 27.vii.1969, 4 apt. (*V.F.E.*). MAJORCA: Clan Picafort, 4.v.1969, 2 apt. (*D. J. Williams*). NETHERLANDS: Wageningen-Hoog, *J. communis*, 1.v.1938, 3 apt., ? fundatrices (*D. Hille Ris Lambers*). NORWAY: Ås, Vollebekk, trapped, 7.vii.1954, 1 al. (*H. Tambs-Lynche*). SWITZERLAND: Zenegger Wallis, *J. communis*, 21.v.1947, 2 apt., ? fundatrices (*Stäger* coll.), D. Hille Ris Lambers colln. TURKEY: Bolu-Aladag ormani, 1600 m, *Juniperus nana*, 3.vii.1964, 33 apt., 1 al. (*H. Çanakçioğlu*).

NEW ZEALAND: Auckland, *Juniperus*, 11-12.i.1960, 59 apt., 1 alatoid nymph (*V.F.E.*).

CANADA: Seattle, juniper, 29.iii.1940, 1 apt. (*C. L. Richie*).

HOST-PLANTS. *Juniperus chinensis* including *kewensis*, *J. communis* including *depressa*, *effusa*, *hibernica* and *nana*, rarely *J. oxycanus* and has also been recorded from *J. oxycedrus*, *J. rigida* and *J. squamata*.

DISTRIBUTION. *Cinara juniperi* has been seen from the Azores, Czechoslovakia, England, Germany, Guernsey, Majorca, Netherlands, Norway, Scotland, Switzerland, Turkey, Wales, New Zealand and 'Canada, Seattle'. Also recorded from Austria, Belgium (Schouteden, 1906 : 203), Bulgaria (Szelegiewicz, 1962*a* : 48), Greenland (Hille Ris Lambers, 1952 : 127), Latvia (Zirnits, 1927 : 251), Morocco, Poland, Ukraine, Bokhara (Jakhontov, 1929 : 15), Sweden, Japan (on *Juniperus rigida*: Inouye, 1970 : 89–91), Taiwan (on *Juniperus squamata*: Takahashi, 1937 : 2–3), Minnesota (Oestlund, 1922 : 118) and Ontario (MacNay, 1953 : 4).

BIOLOGY. *Cinara juniperi* is anholocyclic in Southern England and Wales with alatae viviparae found only in May and June. Apterae viviparae are common in May and June and occur more sparsely on the aerial parts of Juniper during the rest of the year. Alatae are also found in Scotland in June but a single alata collected in August has also been seen. It seems that *Cinara juniperi* is holocyclic in Central Europe. *C. juniperi* may be a widespread anholocyclic form of a more restricted species, holocyclic on *Juniperus communis*, for which the name *C. mordwilkoi* (Pašek) may be available. Rupais (1961 : 17–18) records *Cupressobium mordwilkoi* from Latvia.

Cinara kochiana (Börner)

(Text-figs 22–25)

[*Aphis laricis* Walker, 1848 : 102–103, partim, oviparae and probably '1st var.' (see Doncaster, 1961 : 93); 1852 : 957.]

? *Lachnus laricis* Koch, 1856 : 241–243 partim. [No types, locality not stated, presumably GERMANY]; Cholodkovsky, 1898 : 666 partim.

? *Lachniella laricis cuneomaculata* Del Guercio, 1909 : 291–293. [Types unknown. ITALY: Pratolina, *Larix europaea*, July, aptera.]

Cinara laricis (Koch) Braun, 1938 : 482, 483, 488–491, ? partim.
Cinaria kochiana Börner, 1939 : 76. [Said to be nom. n. pro *laricis* Koch nec Walker, 1848, but probably not Koch's species. Börner's material in Deutsches Entomologische Institut. Neither Börner nor Koch gave locality data but both probably from Germany or Austria.]
? *Cinara kochi* Inouye, 1939 : 138–141. [Said to be a nom. n. pro *laricis* Koch, 1857 nec Walker, 1848, as interpreted by Braun (1957 : 488–491), but Inouye describes five oviparae from Japan: Hokkaido, *Larix kaempferi*, 13.xi.1936. Types Govt. Forest Experiment Stn., Hokkaido.]
Cinaria (*Laricaria*) *kochiana* Börner; Börner, 1949 : 59.
Laricaria kochiana (Börner) Börner, 1952 : 42; Pašek, 1954 : 247–256; Heinze, 1962 : 160, 162.
Cinara (*Laricaria*) *kochiana* (Börner) Stroyan, 1957 : 348–349.
Cinara kochiana (Börner) Hille Ris Lambers, 1956 : 246; Kloft, Kunkel & Ehrhardt, 1960 : 161–164; Szelegiewicz, 1962 : 83; Shaposhnikov, 1964 : 523; Pintera, 1966 : 316–318.

Material studied.

England: London, Southgate, larch, 16.x.1847, 3 oviparae (*F. Walker*), slides 500 & 501.

Czechoslovakia: Banska Stiavnika, *Larix decidua*, 7.vi.1952, 2 apterae viviparae (*V. Pašek*), D. Hille Ris Lambers colln.; 23.vi.1952, 1 apt. (*V. Pašek*), BMNH. Netherlands: Putten, *Larix leptolepis*, 11.viii.1952, 2 apt. (*Elton* coll.), D.H.R.L. colln. Bennekom, *L. decidua*, 19.x.1946, 1 ovip.; Arnhem, *L. leptolepis*, 29.x.1952, 2 ovip.; November 1952, 1 ovip., 1 alate male (*D. Hille Ris Lambers* & colln.). Poland: Chetmowa Gora pow. Kieke, *Larix polonica*, 20.x.1961, 7 apt., 1 al. (*H. Szelegiewicz* & colln.). Sweden: Brunnhy, Kullen, *Larix decidua*, 25.viii.1964, 1 apt. (*F. Ossiannilsson* & colln.). Korea: Mt Chiri, *Pinus koraiensis*, 15.vi.1963, 1 apt. (*Woon Hah Paik*).

Host-plants. *Larix decidua* (= *europaea*, including *polonica*) and *L. leptolepis* (= *kaempferi* Sarg.) and also recorded from *Pseudolarix amabilis* (= *kaempferi* Gord.).

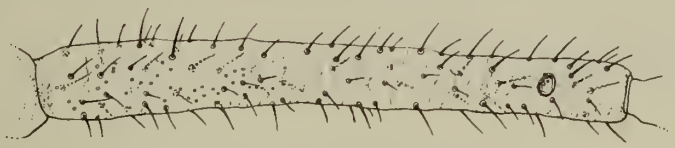
Distribution. Specimens have been seen from Czechoslovakia, England, Netherlands, Poland, Sweden and Korea (subsp. *kochi* see Paik, 1965 : 18–19) and are also recorded from Austria, Germany, Italy, Rumania, Ukraine and the sub-species *kochi* from Japan.

Biology. According to Pintera (1966 : 318) *Cinara kochiana* lives at the bases of the older branches near the trunk, on the trunk or on thick roots. It forms large colonies in crevices in the bark and is always associated with ants. Oviparae are produced in October and November and an alate male has been seen from Arnhem in November. The few alatae seen or recorded were collected in August and October.

Notes. The hairy ultimate rostral segment separates *kochiana* from other European *Cinara* but several North American species living on *Pinus*, including *Cinara pinata*, *C. piniradicis*, *C. puerca*, *C. tanneri* and *C. thatcheri* bear 20–50 accessory hairs on the ultimate rostral segment.

The oviparae of *C. kochiana* bear numerous rather indistinct pseudosensoria on the hind tibiae and the eggs in the abdomen are about 2 mm long and 0·9 mm wide.

Braun (1938 : 482–491) found *Cinara kochiana* and called it *C. laricis* (Koch), although part at least of Koch's description does not fit *kochiana*. Subsequent authors proposing new names for *laricis* Koch nec Walker or Hartig, have been



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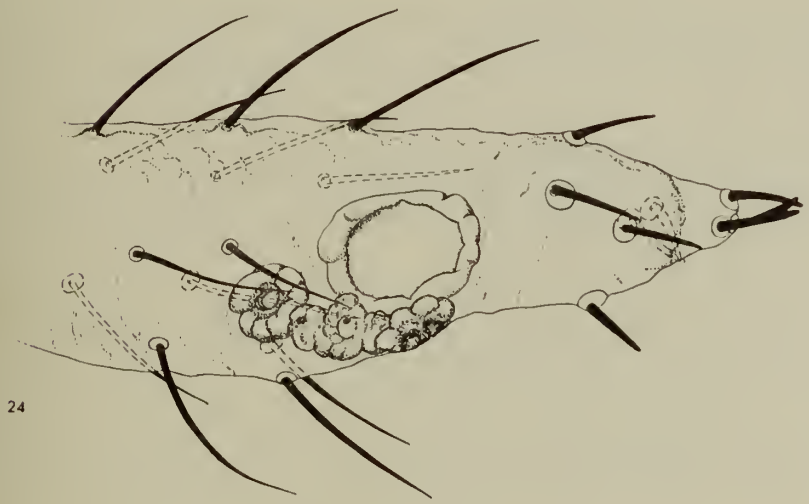

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FIGS 22–25. *Cinara kochiana*, aptera vivipara. 22, third antennal segment, × 87. 23, sixth antennal segment, × 87. 24, processus terminalis, × 450. 25, fourth and fifth rostral segments, × 87.

accepting Braun's (1938) interpretation of *laricis* Koch. *Cinara kochi* Inouye, 1939 does not seem to be more than subspecifically distinct from *kochiana* according to Hille Ris Lambers (1956 : 246) and Inouye (1970 : 68–69). Börner (1939) lists *laricis cuneomaculata* as a synonym of *kochiana* but some of the proportions given by Del Guercio (hind tibia/hind tarsus 2 = 6·3; rostral 4 + 5/hind tarsus 2 = 0·74; rostral 4/hind tarsus 1 = 1·2), agree with *boerneri* and would exclude *kochiana*.

Cinara laricis (Walker)

Aphis laricis Walker, 1848 : 102–103, partim. [Lectotype BMNH, ENGLAND.]
? *Aphis tenuior* Walker, 1849 : xlix. [Possible type in BMNH, described without locality or date: see Doncaster, 1961 : 132.]
? *Lachnus laricis* Koch, 1856 : 241–243, partim. [No types, locality not given, presumably GERMANY.]
[*Lachnus pinicolus* Kaltenbach; Buckton, 1881 : 52–53, partim, the alate males recorded as 'winged viviparous females'.]
Lachnus laricis (Walker) Cholodkovsky, 1898 : 666–667; 1902 : 7; Schouteden, 1906 : 203–204; van der Goot, 1915 : 399–400.
Lachnus maculosus Cholodkovsky, 1899 : 469–470. [Types unknown. Described without locality, presumably near Leningrad.]
Lachniella nigrotuberculata Del Guercio, 1909 : 288, 306–309. [Types unknown. ITALY: Protolina, *Larix* sp., spring 1907, apterae and alatae viviparae.]
[? *Lachnus laricifex* (Fitch) Patch, 1912 : 164. Misidentification.]
Lachniella laricis (Walker) Jackson, 1919 : 164.
Dilachnus laricis (Walker) Swain, 1921 : 213; Wellenstein, 1930 : 749–750.
Lachnus muravensis Arnhart, 1927 : 471. [Possible types in BMNH; AUSTRIA.]
Panimerus laricis (Walker) Theobald, 1929 : 135–139, partim, the sexuales and some of the alatae viviparae are *C. boerneri*.
? *Cinara laricis* (Hartig) Hottes & Frison, 1931 : 155–156.
Cinara laricis (Walker) Hille Ris Lambers, 1931 : 3; Börner, 1932 : 569; Mordwilko, 1933 : 169; Braun, 1938 : 478; Pašek, 1954 : 253–256; Inouye, 1956 : 216; Doncaster, 1961 : 92–94; Szelegiewicz, 1962 : 83; Shaposhnikov, 1964 : 523.
Neochmosis laricis (Walker) Hille Ris Lambers, 1935 : 63.
Cinara laricis (Hartig) Inouye, 1962 : 147–151; 1970 : 65–66; Pintera, 1962 : 293–295.
Cinaria laricis (Walker) Börner, 1939 : 76; 1952 : 42; Heinze, 1962 : 163, 164.
Cinara doncasteri Pašek, 1953*c* : 222, 223; 1954 : 134, 141, 142. [Holotype, BMNH. SCOTLAND]; Heinze, 1962 : 159, 160; Pintera, 1962 : 292–293. **Syn. n.**

MATERIAL STUDIED.

Lectotype aptera vivipara, ENGLAND: London, Southgate, larch, 2.viii.1847, F. Walker slide no. 498.

One larva on the type-slide and another, 2.ix.1847, F. Walker 494. Surrey, Kew Gardens, *Larix decidua*, 26.x.1968, 2 oviparae, 1 alate male (*V.F.E.*). Berks, Mortimer, 'Larch/grass area', 2.vii.1959, 1 al., Forest Research Stn, Alice Holt colln. Herefordshire, Mortimer, *Larix eurolepis*, 14.ii.1959, 1 al. (*C. I. Carter*). Derbys, Smerrill Grange, *L. europaeus*, 22.vi.1946, 12 apt., 4 al.; Wensley, *L. europaeus*, 30.vi.1946, 2 al. (*J. P. Doncaster*). Westmorland, Windermere, Bishop's Wood, *Larix leptolassa*, 4.vi.1914, 3 al. (*Rymer Roberts*), F. V. Theobald colln.;

Farlwood, *L. leptolepis*, 13.v.1915, 1 al.; Ellerbeck, Kendal, oak, 26.vi.1914, 1 al. (*F. V. Theobald*). Cumberland, Dunnerdale, *L. europaeus*, 5.vii.1953, 5 apt. (*J. P. Doncaster*). SCOTLAND: '48–121' without further collection data, 1 al. (*F. Doubleday*), Walker colln. no. 676. Inverness, summit of Braeriach, 4000', 28.vi.1932, 2 al. (*B. M. Hobby*) (types of *Cinara doncasteri*). Perth, Pitlochry, Faskally, *Larix decidua*, 21.v.1966, 2 apt. (*C. I. Carter*). Edinburgh, *L. decidua*, 22.x.1962, 1 ovipara; 'Bush nursery, *Larix* grafts', 22.x.1962, 4 alate males (*C. I. Carter*) (2 in Forest Res. Stn, Alice Holt colln.).

AUSTRIA: 'August 1927, *Lachnus muravensis*, Dr Arnhart', 5 apterae & larvae without further data. CZECHOSLOVAKIA: 'conifer', 1 al. without further data ex F. V. Theobald colln. Banska Stiavnika, *Larix decidua*, 13.vi.1950, 2 apt.; Bohemia, C. Krumlov, 13.viii.1951, 4 apt. (*V. Pašek*). GERMANY: Röth b. Berchtesgaden, *L. europea*, 23.vii.1952, 6 larvae (*H. Schmutterer* coll.), K. Heinze leg. Berlin, Dahlem, *L. europaea*, 1 apt., 1 larva, 8.vii.1950 (*W. Quednau* coll.), K. Heinze leg. ITALY: Zuel near Cortina, *Larix* sp., 30.vii.1969, 1 apt., 24 al. (*V.F.E.*). NETHERLANDS: Arnhem, *L. leptolepis*, November 1952, 2 oviparae (*J.T.B.O.N.*), D. Hille Ris Lambers colln.

HOST-PLANTS. *Larix decidua* (= *europaea* including *polonica*), *L. leptolepis* (= *kaempferi* Sarg.) and also recorded from *Larix laricina*, *L. sibirica* and *Pseudolarix amabilis* (= *kaempferi* Gord.).

DISTRIBUTION. Specimens have been seen from Austria, Czechoslovakia, England, Germany, Italy, Netherlands, Scotland and have also been recorded from Latvia (Rupais, 1961 : 14), Poland, Sweden, Switzerland (Werder, 1934 : 15), Ukraine, Mongolia (Szelegiewicz, 1963 : 113), Japan (Inouye, 1962 : 150) and with a query from Eastern Siberia (Grechkin, 1962 : 706). Records from America probably apply to other species.

BIOLOGY. Apterae viviparae can be collected from May until September and alatae viviparae in June and July. Single alatae have also been seen from February and May in Western Britain. Oviparae are produced in October and November. *Cinara laricis* lives under the old branches of *Larix* together with *Formica rufa* and when disturbed the alatae often do not fly but run towards the tree trunk, where they hide in crevices in the bark. It is a more northern or alpine species than *C. boerneri* although a few specimens of *C. laricis* have been collected with the more abundant *C. boerneri* in Southern Britain and a few specimens of *C. boerneri* have been collected among the more abundant *C. laricis* in the Dolomites near Cortina. Inouye (1962 : 147–151) describes both fundatrices and sexuales from Japan.

The eighth abdominal tergite of *Cinara laricis* usually bears 15–18 hairs dorsally but there may also be a ventro-lateral group of 1–5 hairs on either side bringing the total for the tergite up to as many as 25.

The copious honeydew crystalizes to form the 'Lärchenmanne' which is important to bee-keepers in central Europe.

Lachnus laricis Hartig, 1839 was not described in sufficient detail to make it certain that it should be placed in *Cinara*, let alone be applied to any particular species. Hottes & Frison (1931 : 155–156) place *laricis* Walker as a synonym of

laricis Hartig but from their key it seems likely that they did not have Walker's species. Hottes (1953 : 158) discusses the identity of *Cinara laricifex* (Fitch). Shinji (1941 : 244–248) had *C. laricicolus* (Matsumura) according to Inouye, 1962 : 155.

Cinara laricifoliae (Wilson, 1915) from *Larix occidentalis* in North America is similar to *C. laricis* but bears rather shorter hairs on the body and appendages and five sub-apical setae on the processus terminalis, according to a single aptera vivipara kindly provided by Mr G. A. Bradley. A single ovipara of *C. lyallii* Bradley, 1956 (leg. G. A. Bradley) from *Larix lyallii* in Alberta is similar to *C. laricifoliae* except for the smaller siphuncular cones and may only be a form of *C. laricifoliae*. *Cinara spiculosa* Bradley, 1956, from *Larix laricina* in Labrador, New Brunswick and Saskatchewan is also similar to *C. laricis* but is usually smaller and the body bears bifurcate dorsal hairs.

Cinara pectinatae (Nördlinger)

(Text-figs 26 & 27)

[*Aphis piceae* Panzer; Nördlinger, H., 1863 : 133–137. Misidentification.]
Aphis pectinatae Nördlinger, A., 1880 : 63. [No types. ? GERMANY.]
[*Lachnus piceae* (F.) Altum, 1880 : 352–353. Misidentification.]
Lachnus pichtae Mordwilko, 1895*a* : 84, 85, 94, 96, 103. [Types unknown. GERMANY: Böhmen, Carlsbad, *Abies pectinata*, 1893 (*M. Pawlowa*)]; 1895*b* : 104–105; Cholodkovsky, 1898 : 665; 1902 : 7; van der Goot, 1915 : 403–405.
Eulachnus macchiatii Del Guercio, 1909 : 316, 321–324. [Types unknown. ITALY: extremities of the twigs of *Abies pectinata*, *Pinus picea* or *Picea excelsa*, in September & October.]
Lachniella pichtae (Mordwilko) Jackson, 1919 : 164–165.
Panimerus pichtae (Mordwilko) Theobald, 1929 : 140–142.
Dilachnus pichtae (Mordwilko) Wellenstein, 1930 : 738, 748–749, 754.
Cinara pichtae (Mordwilko) Börner, 1932 : 568; Mordwilko, 1948 : 202.
Cinara pectinatae (Nördlinger) Braun, 1938 : 478, 485; Kloft, Kunkel & Ehrhardt, 1960 : 165–166; Szelegiewicz, 1962 : 84; Shaposhnikov, 1964 : 522.
Neochmosis pichtae (Mordwilko) Kloet & Hincks, 1945 : 72.
Buchneria pectinatae (Nördlinger) Börner, 1952 : 41; Pašek, 1954 : 263–266; Heinze, 1962 : 160.
Cinara (*Buchneria*) *pichtae* (Mordwilko) Bodenheimer & Swirski, 1957 : 246.

MATERIAL STUDIED.

ENGLAND: Surrey, Wisley, *Abies pindrow brevifolia*, 14.vi.1957, 8 apterae, 1 alata; 6.viii.1953, 2 apt.; 2.ix.1954, 8 apt. (*J. P. Doncaster*). Cambridge, University botanical gdns, *Abies veitchii*, 10–12.x.1950, 5 oviparae; 15.x.1954, 3 ovip., 27.ix.1954, 2 al. viviparae (*H. L. G. Stroyan* & colln.); 16.x.1950, 1 ovip.; 11.ix.1951, 7 apt. viviparae; 8.x.1951, 4 oviparae; *Abies numidica*, 3–24.x.1951, 1 alata vivipara, 1 ovipara & 2 alate males (*V.F.E.*). SCOTLAND: Morayshire, Rothes, *Abies pectinata*, 24–27.ix.1914, 1 apt. (*D. J. Jackson*).

CZECHOSLOVAKIA: Vysoka, *Abies alba*, 16.ix.1952, 2 apt. (*V. Pašek*). NETHERLANDS: Wageningen arboretum, *Abies pinsapo*, 21.vi.1954, 2 apt. (*D. Hille Ris Lambers & J. P. Doncaster*); *A. pectinata*, 1.x.1946, 1 alate male (*D.H.R.L.* & colln.); October 1966, 3 oviparae (*D. Doon* coll.), D.H.R.L. colln. POLAND: Lesn. Podgorze, G. Swietokrzyskia, *A. alba*, 15.vii.1962, 3 apt. (*J. Karpinski*), H. Szelegiewicz

colln. 1868. Zakopane, *A. alba*, 29.ix.1960, 3 oviparae (*R. Bielawski* coll.), H. Szelegiewicz colln. 1430. TURKEY: Borncua-Izmir, 'pine tree', 1948, 4 apt. (*Nihot-Iyriboz*). Bolu-Aladag ormani, 1500 m, *A. bornmuelleriana*, 4.vii.1964, 5 apt. (*H. Çanakçioğlu*).

HOST-PLANTS. *Abies alba* (= *pectinata*), *A. numidica*, *A. pindrow* subsp. *brevifolia*, *A. veitchii* and occasionally *A. bornmuelleriana* and *A. pinsapo*.

DISTRIBUTION. Specimens have been seen from Czechoslovakia, England, Netherlands, Poland, Scotland and Turkey and have also been recorded from Austria, Germany, Sweden, Yugoslavia and the Ukraine.

BIOLOGY. Apterae viviparae have only been seen in Britain during June, September and October. Oviparae and alate males have been collected in October Only four British alatae viviparae are known, one was taken in June, two in September and the other in early October. *C. pectinatae* seems not to have been collected in Britain during July or August. Leonhart (1940) and Fossel (1958) have given accounts of the biology. Gontarski (1941 : 326–327) and Zoebelein (1956 : 374) have investigated the honeydew.

NOTES.

Type-species of *Buchneria* Börner, 1952

The alate males have unusually strongly pigmented abdominal sternites. Hottes & Essig (1954) compare *Cinara pectinatae* with *C. alacra* in its original description and *C. fornacula* Hottes is another similar American species. *Todolachnus abietis* (Matsumura, 1917) is closely related according to Hille Ris Lambers (1966*c* : 124).

FIGS 26 & 27. *Cinara pectinatae*. 26, ♂ genitalia, × 135. 27, aptera vivipara, right siphunculus and part of fifth abdominal tergite, × 87.

Cinara piceae (Panzer)

Aphis piceae Panzer, 1801, no. 22 (2 pp. + plate). [No types. GERMANY]; Zetterstedt, 1828 : 557–558; Kaltenbach, 1843 : 141–142; Walker, 1848 : 95–96.
[*Aphis laricis* Walker, 1848 : 102–103, partim (see Doncaster, 1961 : 93).]
Lachnus grossus Kaltenbach, 1846 : 174–175. [No types. Locality no stated, presumably GERMANY: near Aachen, on fichten, *Pinus abies*, May & June]; Mordwilko, 1895*a* : 96.
[*Lachnus piceae* (Walker) Buckton, 1880 : 58–59, mostly, but one specimen of *Tuberolachnus salignus* was included; Mordwilko, 1895*a* : 99; 1895*b* : 100; Cholodkovsky, 1898 : 655–656; 1899 : 468; Schouteden, 1906 : 205–207; van der Goot, 1915 : 401–402; Mordwilko, 1929 : 27.]
[*Lachnus longipes* (Dufour) Buckton, 1881 : 59–61, partim, aptera only, the alatae are *Tuberolachnus salignus*. Misidentification.]
[*Panimerus vanduzei* (Swain) Theobald, 1929 : 154–156, partim (the Irish specimens are genuine *vanduzei* = *abieticola*). Misidentification.]
Dilachnus piceae (Walker) Wellenstein, 1930 : 738, 742.
Dilachnus grossus (Kaltenbach) Wellenstein, 1930 : 747, 750, 757.
Cinara piceae (Panzer) Börner, 1932 : 569–570; Braun, 1932 : 479, 491; Wahlgren, 1939 : 2; Mordwilko, 1948 : 201; Szelegiewicz, 1962 : 84–85.
[*Cinara vanduzei* (Swain) Börner, 1932 : 570; Braun, 1932 : 479; Onouye, 1937 : 105. Misidentification.]
Cinara piceae (Walker) Mordwilko, 1933 : 159.
Neochmosis piceae (Panzer) Hille Ris Lambers, 1935 : 63.
[*Neochmosis vanduzei* (Swain) Kloet & Hincks, 1945 : 72. Misidentification.]
Cinaropsis (*Mecinaria*) *piceae* (Panzer) Börner, 1949 : 59; 1952 : 44.
Cinaria (*Mecinaria*) *piceae* (Panzer) Pašek, 1954 : 198–200, 201.
Cinara (*Mecinaria*) *grossa* (Kaltenbach) Aizenberg, 1956 : 131–139.
Mecinaria piceae (Panzer) Heinze, 1962 : 166, 167, 168.
Cinara grossa (Kaltenbach) Shaposhnikov, 1964 : 521; Pintera, 1966 : 314–316; Inouye, 1970 : 69.
Cinara piceae var. *pasheki* Szelegiewicz, 1962 : 85. [Types. Polish Academy of Science, Institute of Zoology: CZECHOSLOVAKIA & POLAND.]

MATERIAL STUDIED.

ENGLAND: London, South Kensington, flying over roof of BMNH, 6.v.1961, 1 alata (*J. F. Perkins*). Grounds of Buckingham Palace, light trap, 25–26.vi.1964, 1 al. (*J. D. Bradley*). Kennington, *Picea pectinata*, June 1901, 1 aptera, 1 al. (*F. V. Theobald*). Hants, Alresford, spruce, 28.xii (prior to 1881), 9 eggs (*J. Anderson*), Buckton colln. 339 & 340. Kent, Wye, *Picea excelsa*, 7.vi.1911, 1 al. (*F.V.T.*). Surrey, Wisley, *Picea sitchensis*, 16.v.1938, 5 fundatrices; 2.vii.1938, 3 alatoid nymphs (*F. Fox-Wilson*). Wrecclesham, *P. excelsa*, 10.vi.1963, 1 al. (*C. I. Carter*). Kew Gardens, oriental spruce, August 1926, 2 apt. (*E. V. Laing*). Banstead, *Picea* sp., October 1954, 1 apt. vivipara, 3 oviparae (*B. M. Gerard*). Bucks, Slough, spruce, October 1963, 1 apt. vivip., 2 oviparae (*Royal Horticultural Society*). High Wycombe, October 1968, 3 oviparae (*J. Perry*). Berks, Reading, 15.v.1961, 5 larvae, (*Reading Museum*). Newbury, *Picea sitchensis*, 9.vi.1952, 7 al. (*W. D. Empson*). Oxon, Henley-on-Thames, *P. pungens* var. *glauca*, 24.iv.1961, 20 fundatrices (*T. Barnard*), via A. C. Jermy. Gloucs, Cowley Manor, June 1959, 1 al. (*R. S. George*). Devon, Scots pine, June 1937, 1 apt., 3 al. & alatoid nymph (*L. N. Staniland*). Dorset, Broadstone, *P. spinulosa*, 18.ix.1952, 7 apt. (*C. Carter*). Derbys, Alport,

Hope Forest, *P. sitchensis*, 19.vii.1965, 1 al. (*C. I. Carter*). Cambridge, *Picea* sp., 26.x.1950, 47 oviparae (*H. L. G. Stroyan*). Cumberland, Penrith, spruce, 1.x.1913, 1 apt. vivip., 1 ovipara (*F. R. Markham*). Keswick, silver fir, 20.vi.1961, 1 al. (*P. Becker*). Westmorland, without further data, 3 al. & 2 alatoid nymphs (*G. B. Piffard*). Yorks, Allerston Forest, *P. excelsa*, 13.vii.1949, 2 al. (*H. S. Hanson*). Also in the BMNH collection are 9 alatae without data on Walker slides 638–646, 2 alatae from spruce collected by *G. Saunders* on G. B. Buckton slide 336 and 1 ovipara, 29.xi.—, Buckton slide 341, on which Buckton's interpretation of *longipes* Dufour is based. SCOTLAND: Lochgoilhead, July 1922, 1 al. (*A. Cuthbertson*). Novar, spruce, 31.x.1923, 1 ovipara (*A. S. Watt*). S. Queensferry, Hopetown, sitka spruce, 28.ix.1931, 1 apt. vivip., 4 oviparae (*G. C. R. McLaggan*). Aberdeen, Dee Valley, spruce, 29.vi.1965, 1 al. (*M. Crooke*). EIRE: Dublin, *Picea sitchensis*, October 1959, 4 oviparae.

AUSTRIA: Saalbaach, at light, 29.vii.1962, 1 al.; 'Yellow Composite Stars', 30.vii.1962, 2 al. (*M.C.*); Spider's web, 30.vii.1962, 1 al. (*M. Clifton*). Gross Glochner Pass, on pine fence, 24.vii.1967, 6 al. (*H. J. Banks*). CZECHOSLOVAKIA: without further data, 1 al., F. V. Theobald colln. Banska Stiavnika, *Picea excelsa*, 7.v.1950, 1 fundatrix; *P. orientalis*, 13.v.1950, 1 fundatrix; 23.viii.1950, 3 apt. Gelnica, *P. excelsa*, 18.vi.1952, 1 apt. Zilina, *P. excelsa*, 10.viii.1949, 2 apt. (*V. Pašek*). One alata collected prior to 1933 by *D. Aubertin*, without further data. FRANCE: Savoy, Glacier des Evettes, 2600 m, July 1929, 2 al. (*P. Vayssière*). ITALY: Dolomites, Mt Sella, 8–9000', 8.viii.1962, 7 al. (*O. W. Richards*). NETHERLANDS: Bennekom, *P. excelsa*, 25.ix.1946, 3 apt. viviparae, 1 ovipara; Ede, *P. sitchensis*, 28.v.1957, 1 fundatrix or second generation aptera (*D. Hille Ris Lambers* & colln.).

HOST-PLANTS. *Picea* species, mostly of the *Eupicea* group; seen from *Picea abies* (= *excelsa*, *rubra* A. Dietr. nec Du Roi) including the variety *fennica* and more rarely *P. glauca* (= *alba*, *canadensis*), *P. orientalis* and also recorded from *Picea obovata*, *P. pungens* and *P. schrenkiana* (= *tianschanica*). Also seen from *Picea sitchensis* of the *Cascita* group and *P. spinulosa* of the *Omorika* group.

DISTRIBUTION. Specimens have been seen from Austria, Czechoslovakia, Eire, England, France, Italy, Netherlands, Scotland and are also recorded from Belgium ((Schouteden, 1906 : 203), Finland, Germany, Norway, Poland, Sweden, Switzerland, U.S.S.R., Estonia, Latvia (Zirnits, 1927 : 251), Ukraine, Kazakhstan and Japan (Inouye, 1970 : 69). The records from Spitzbergen are based on wrongly identified specimens of *C. abieticola* (see p. 125).

BIOLOGY. In Southern England adult fundatrices are present by late April or early May and apterae viviparae have been collected in June and from August to October: alatae viviparae occur in May and June. Alatae are more abundant than apterae during June. In Derbyshire, Yorkshire and Scotland alatae occur during June and July. Oviparae occur in September and are the commonest form found during October. Males have not been seen. According to Pintera (1966 : 316) the eggs hatch rather late and the colonies feed first on the older branches and trunk and move down to the roots in the summer. Attended by ants, especially

Formica and *Camponotus* spp. Inouye (1970 : 69) gives an account of the biology in Japan. *Cinara piceae* is a large aphid which sometimes occurs in large numbers in parks and gardens during spring and early summer and in the autumn. It may cause damage to the twigs and Nuorteva (1957 : 35–36) has investigated the saliva. Gontarski (1941 : 321–322) and Zoebelin (1956 : 373–374) have studied the honeydew.

Notes.

Type-species of *Mecinaria*, Börner, 1949

From Panzer's (1801) account of *Aphis piceae*, 'Die Blattlaus auf der Weistanne' it seems that he had seen both *C. piceae* (= *grossa*) from *Picea* and *C. abieticola* from *Abies*, and considered them to be the same species. He coined his scientific name from the host of the spruce-feeding aphid and his common name from the host plant of the fir-feeding aphid. His description and illustration however applies to the *Picea*-feeding species, the reddish hind tibiae with dark apices being typical for the *Picea*-feeding aphid and excluding *C. abieticola*, which has entirely dark hind tibiae. Panzer used the name *Pinus picea* for spruce, *Picea abies* (= *excelsa*) and used the name *Pinus Abies* for fir, *Abies alba* (= *pectinata*). Kaltenbach used *Pinus Abies* for *Picea abies*, spruce. The use of the name *Picea abies* for both the common spruce and a widely planted fir has contributed to the confusion in aphid literature.

The *Picea*-feeding aphid *Cinara piceae* is distinguished from the *Abies*- and *Cedrus*-feeding species *C. abieticola* by 10 of the 31 characters given in Table 3 (page 173) but *C. piceae* is similar in many respects to the North American *C. curvipes* (Patch) which also lives on *Abies* and *Cedrus*.

The oviparae resemble the viviparae in the absence of pseudosensoria on the hind tibiae. *Cinara piceae* is also unusual in that while oviparae are common, males are unknown. The pseudosensoria on the hind tibiae of most oviparae are thought to emit pheromones (Pettersson, 1970 : 63–73). The fundatrices also resemble the later generations of apterae viviparae and are not more densely hairy as they are in other species of *Cinara*. The unusual similarity between fundatrices and apterae viviparae may indicate that *Picea* has only recently been acquired as a host plant. *Cinara piceae* is very different from the other European species of *Cinara* feeding on *Picea*. The fundatrices of *C. piceae* may be recognized by the processus terminalis being only 9–22% of the length of the sixth antennal segment and the base of the sixth antennal segment is 0·55–0·66 times as long as the fourth rostral segment, while in the later generations of apterae viviparae the processus terminalis is 18–28% of the length of the sixth antennal segment and the base of the sixth antennal segment is 0·42–0·54 as long as the fourth rostral segment.

Cinara pilicornis (Hartig)

(Text-figs 28–31)

[? *Aphis pineti* F.; Zetterstedt, 1828 : 558–559 (see Wahlgren, 1939 : 2). Misidentification.]

Aphis pilicornis Hartig, 1841 : 369. [Types unknown. Locality not stated, presumably Germany.]

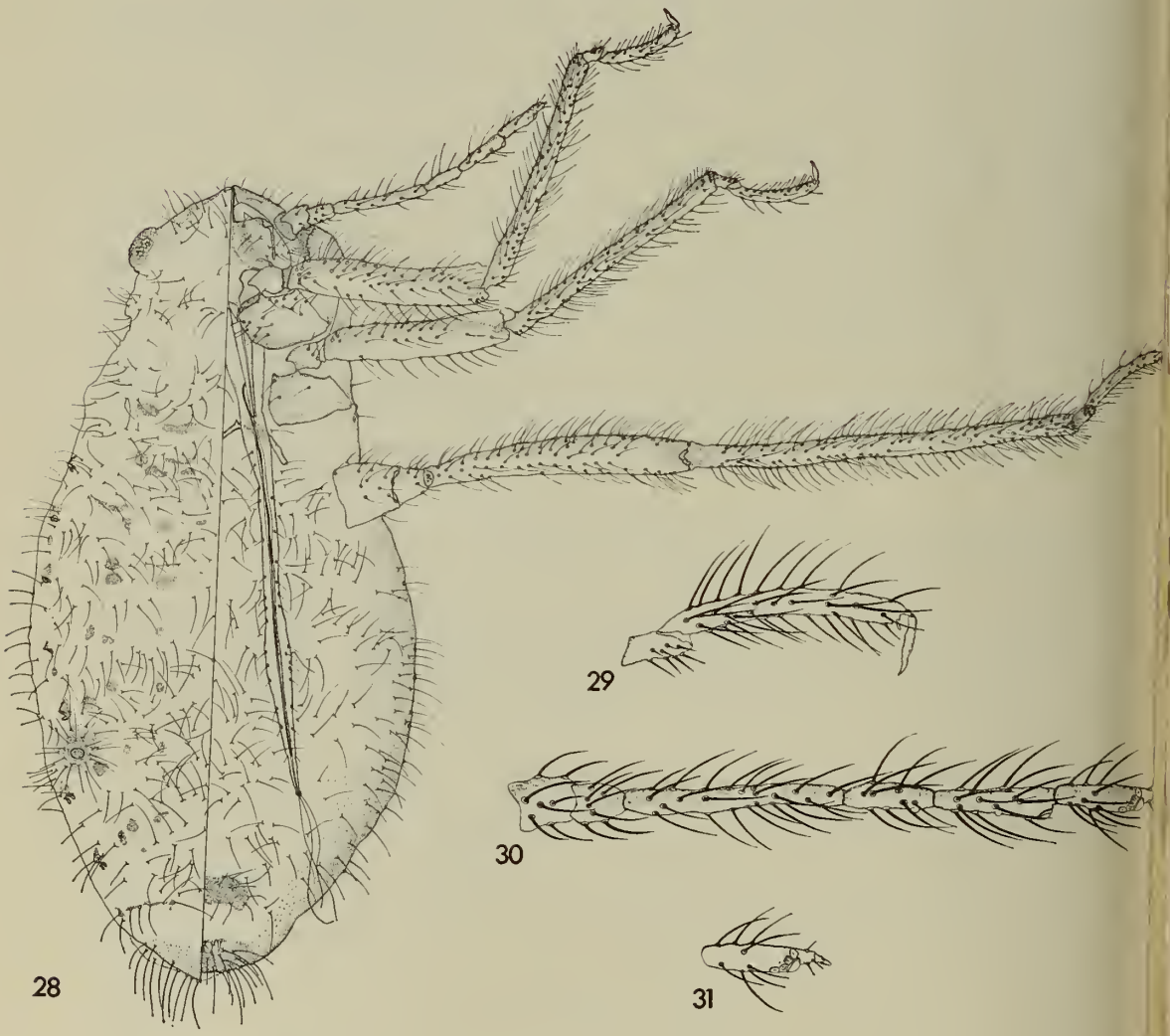
? *Lachnus pinicola* Kaltenbach, 1843 : 154–155. [Types unknown. Locality not stated,

presumably GERMANY: on spruce, April to August]; Schouteden, 1906 : 207.
Aphis abietis Walker, 1848 : 100. [Lectotype, BMNH, ENGLAND.]
Lachnus hyalinus Koch, 1856 : 238–240. [No types. Locality not stated, presumably GERMANY: on spruce, June, apterae and alatae]; Mordwilko, 1895*b* : 106–107; Cholodkovsky, 1896*a* : 146–148; 1898 : 663–665; ? Patch, 1912 : 165–167; van der Goot, 1915 : 394–396.
Lachnus macrocephalus Buckton, 1881 : 48–50. [Type, BMNH: ENGLAND.]
Lachnus flavus Mordwilko, 1895*a* : 94, 101–102; 1895*b* : 133–134. [Types unknown. Without locality, presumably POLAND]; Cholodkovsky, 1898 : 659.
[? *Lachnus pinicola* Kaltenbach; Mordwilko, 1895*a* : 100–101. Misidentification.]
? *Lachnus piceicolus* Cholodkovsky, 1896*a* : 146, 148–150. [Types unknown. U.S.S.R., near Leningrad & Estonia, on spruce, 1895 & 1896]; 1898 : 402–403; 659–662; 1902 : 7.
[? *Lachnus pinicolus* Kaltenbach; Del Guercio, 1900 : 108. Misidentification.]
Lachniella hyalina (Koch) Del Guercio, 1909 : 303–305.
Lachnus abietis (Walker) Wilson & Vickery, 1918 : 27.
[? *Lachniella pinicola* (Kaltenbach) Jackson, 1919 : 165. Misidentification.]
Dilachnus hyalinus (Koch) Swain, 1919 : 213.
[*Panimerus pinicola* (Kaltenbach) Theobald, 1929 : 129–131. Misidentification.]
Panimerus pinihabitans (Mordwilko) Theobald, 1929 : 132–135. Misidentification.]
Panimerus hyalinus (Koch) Theobald, 1929 : 152–153.
Neochmosis abietis (Walker) Theobald, 1929 : 352–354.
[? *Cinara pinicola* (Kaltenbach) Hottes & Frison, 1931 : 156–157. Misidentification.]
[*Cinara pinicola* (Kaltenbach); Börner, 1932 : 568; Braun, 482. Misidentification.]
? *Cinara nopporensis* Inouye, 1937 : 100–137. [Types in Entomological Institute of Hokkaido Imperial University. JAPAN: Hokkaido, *Picea glehni*, May, June & September, 1936.]
[*Cinaropsis pinicola* (Kaltenbach) Börner, 1939 : 76. Misidentification.]
? *Cinara hyalina* (Koch) Blanchard, 1939 : 864–865.
? *Cinara piceicola* (Cholodkovsky) Palmer, 1945 : 447–448; 1952 : 39–40 (see Hottes, 1952 : 39–40).
Neochmosis hyalinus (Koch) Kloet & Hincks, 1945 : 72.
Cinaropsis pilicornis (Hartig) Börner, 1952 : 43; Heinze, 1962 : 170–171.
Cinara (*Cinaropsis*) *pilicornis* (Hartig) Pašek, 1954 : 207–210; Doncaster, 1961 : 13–15; Inouye, 1970 : 80–81.
Cinara pilicornis (Hartig) Hottes, 1955 : 76–77; Kloft, Kunkel & Erhardt, 1960 : 166; Szelegiewicz, 1962 : 25; Shaposhnikov, 1964 : 522; Pintera, 1966 : 304–307.
[*Cinara* (*Cinaropsis*) *pinicola* (Kaltenbach) Çanakçioğlu, 1966 : 139. Misidentification.]

MATERIAL STUDIED.

ENGLAND: Francis Walker slides 663–666, each labelled only '*pini L.*' and each bearing a single alata vivipara. F. Walker slide no. 4 labelled '*abietis*' only and bearing a single alate male. Single alata vivipara labelled only '20.vi.1949 (*Hanson*). London, Southgate, spruce fir, 3.vii.1847, 1 alata vivipara, 1 alate male (*F. Walker* 7 & 7a); 24.vii.1847, 2 al. ♂♂ (*F.W.* 1167); 16.viii.1847, 2 oviparae (*F. Walker* 370). Surrey, Wisley, young spruce, 1.vii.1958, 3 alatae viviparae; spruce, May 1957, 3 al. (*P. Becker*). *Picea sitchensis*, 14.vi.1957, 5 al. (*J. P. Doncaster*); '*Abies pindrow brevifolia*', 14.vi.1957, 1 al. (*J.P.D.*). Farnham Forest Res. Stn, *Picea sitchensis*, 29.v.1957, 1 al. (*J. H. Styles*). Kew Gardens, *P. likiangensis*, 21.v.1960, 5 apterae viviparae; 16.vi.1961, 3 al.; *P. asperata*, 11.v.1961, 4 apt.; *P. breweriana*, 16.vi.1961, 2 al.; *P. obovata*, 16.vi.1961, 2 apt., 3 al. (*V.F.E.*); *Picea excelsa*, 18.vi.1920, 1 al. (*F. Laing*). Fernhurst, *P. sitchensis*, 11.vii.1967, 1 apt., 1 al.; Middlesex, Moor Park, *Picea*, 15.vii.1962, 1 al. (*V.F.E.*). Herts, Whetstone, m/v light, 5.vi.1961, 1 al.

(*P. H. Ward*). Harpenden, Rothamsted, *P. excelsa*, 16.vi.1920, 1 apt., 2 al. (*F. V. Theobald*). Beds, Streatley, 'scots pine', 9.vi.1913, 9 apt. (*F.V.T.*). Bucks, Slough, spruce, 1937, 1 apt., 3 al. (*A. Downes*). Berks, Reading, *Picea*, 7.vi.1950, 2 al. (*V.F.E.*). Kingsmere, *P. excelsa*, 12.vi.1949, 5 apt., 8 al. (*V.F.E. & A. Mills*).



Figs 28–31. *Cinara pilicornis*, aptera vivipara. 28, × 30. 29, hind tarsus, × 87. 30, antenna, × 87. 31, sixth antennal segment, × 87.

Hants, Bramshot, '*Abies*' *excelsa*, 26.vii.[prior to 1881], 1 ovipara, 2 alate males (*G. B. Buckton* (slide 274, type-series of *macrocephalus*)). Headley, *Picea excelsa*, 29.v.1950, 4 apt. (*V.F.E.*). Sussex, Ashdown Forest, *Picea*, 5.vii.1961, 1 al. (*H. K. Airy Shaw*). Kent, Bromley, *Picea abies*, 5.vii.1965, 2 al. (*H. C. Dale*). Wye, spruce, 5.vii.1913, immature including 1 alatoid nymph; 2.vi.1914, 5 al.; 10.viii.1920, 2 al. (*F.V.T.*). Vagrant alata, 14.vii.1927 (*F.V.T.*). Cambridge, University botanic gdn, *Picea likiangensis*, 12.vi.1952, 10 al.; *P. asperata*, 11.ix.1952, 1 apt. vivipara, 1 ovipara (*V.F.E.*). *Picea* sp., 26.x.1950, 3 oviparae (*H. L. G. Stroyan* & colln.). Staffs, Burton-on-Trent, *Picea sitchensis* (as *Abies menziesii*), 5.vii.1847, 1 al. (*F. Walker*, 369). Cumberland, Great Salkeld, spruce, 2–3.vi.1911, 1 apt., 4 al.; 4.v.1913, immature; 26.vi.1914, 1 apt., 2 al. Penrith, spruce, 3.vi.1911, 6 al. (*F. V. Theobald*). Ennerdale, *P. sitchensis*, 3.vii.1945, 2 al. (*H. S. Hanson*). SCOTLAND: Aberdeen, Seaton's nursery, 'on broom', July 1926, 5 apterae viviparae, 2 of them ovipariform and 2 alatae viviparae (*E. V. Laing*). Sutherland, R. Shin, 2 m. west of Inveran, *Picea abies*, 9.vii.1961, 3 al. (*J. P. Doncaster*). Caithness, Rumster Forest, *P. sitchensis*, 4 apt., 1 alatoid nymph (*C. I. Carter*). WALES: Anglesey, Wern Forest, *Picea*, 4.vi.1963, 6 apt. (*V.F.E.*). IRELAND: Rathdrum, *Pinus sylvestris*, 22.vi.1912, 1 al.; spruce, 22.v.1913, 2 apt. (*F. V. Theobald*).

AUSTRIA: Gross Glochner Pass, pine fence, 24.vii.1967, 1 al. (*H. J. Banks*). Carinthia, Ossiach, *Picea*, 8.viii.1966, 1 apt. (*V.F.E.*). CZECHOSLOVAKIA: Gelnica, *P. excelsa*, 17.vi.1952, 3 apt.; Palana Mountain, *P. excelsa*, 22.vi.1951, 2 apt., 1 al. (*V. Pašek*). GERMANY: Zucht von Schleipitz, *P. excelsa*, 5.xi.1940, 1 ovipara (*K. Heinze*). Gratrath, *P. excelsa*, 16.vii.1952, 1 apt. (*H. Schmutterer* coll., K. Heinze leg.). Rottbitze nr Bonn, *Picea* seedling, 18.viii.1966, 9 apt. (*V.F.E.*). NORWAY: Espeland, Fana, trapped, 28.vi.1954, 1 al. (*H. Tambs-Lyche*). SWEDEN: Trey-töa, *Picea pungens*, 16.vii.1949, 1 al. (*F. Ossiannilsson*). TURKEY: Istanbul, Bahcekoy, 110 m, *P. abies*, 5.vi.1964, 8 apt., 8 al.; Artvim, Kurukürun, 1940 m, *P. orientalis*, 8.viii.1964, 4 apt., 1 al. (*H. Çanakçioğlu*).

AUSTRALIA: N.S.W., Bilpin, *Picea abies*, 10.viii.1967, 1 apt., 1 al. (*M. Casimir* coll.), M. Carver leg.

HOST-PLANTS. *Picea* species of the *Eupicea* and *Cascita* groups; specimens have been seen from *Picea abies* (= *excelsa*, *rubra* A. Dietr. nec Du Roi), *P. asperata*, *P. obovata*, *P. orientalis* and are also recorded from *P. glauca* (= *alba*, *canadensis*), *P. koyamai* (= *koraiensis*), *P. pungens*, *P. rubens* (= *rubra* Du Roi), *P. schrenkiana* (= *tianschanica*) of the *Eupicea* group; seen from *P. likiangensis*, *P. sitchensis* and also recorded from *P. engelmanii* of the Cascita group and one sample has also been seen from *Picea breweriana* of the *Omorika* group.

DISTRIBUTION. Specimens have been seen from Austria, Czechoslovakia, England, Germany, Ireland, Norway, Scotland, Sweden, Turkey, Wales and New South Wales, Australia. *Cinara pilicornis* is also recorded from France, Hungary, Iceland, Japan, Netherlands, Poland, Roumania, Yugoslavia, U.S.S.R., Latvia, Lithuania, Estonia, Georgia, Ukraine, Khazakhstan, Caucasus and is said to have been introduced to America (Patch, 1912; Burnham, 1938; Archibald, 1958 : 106). American specimens resembling *pilicornis* seen by the present author appear to belong to

related American species such as *braggii*. Blanchard's (1939 : 864–865) description of the single alata he collected on *Abies* and identified with *C. hyalina* fits *C. pilicornis* but as there are several similar North American species, the Argentinian record cannot be accepted with certainty. Gomez Menor (1962 : 382–386) applies the name *pilicornis* to what appears to be a short-haired member of the *pini* group. Gomez Menor's (1934 : 1372) record of *Cinara pinicola* from Dominica was probably not based on *pilicornis* either.

Biology. Apterae viviparae can be collected from May to July and one specimen has been seen from September. Alatae viviparae occur from May to August and sexuales from July to September. A much higher proportion of viviparae are winged than in other British *Cinara* and the sexuales start to occur earlier in the year than usual in *Cinara*. Cholodkovsky (1895 : 659–662) gives an account of the biology of what he calls *Lachnus piceicola* near Leningrad and in Estonia, saying that sexuales occur from mid June onwards. Pintera (1966 : 304) lists papers dealing with the biology of *C. pilicornis* which in botanical gardens is only casually attended by *Lasius niger*. Börner & Franz (1956 : 308) attribute the wide geographical distribution of *Cinara pilicornis* to its comparative independence of ants. Other authors state that there is a close association with ants. These discrepancies may be due to confusion with *Cinara stroyani* (= *piceicola* auct.). Kurir (1964 : 139–157) gives an account of an outbreak in Austria of *C. pilicornis* and of its natural enemies.

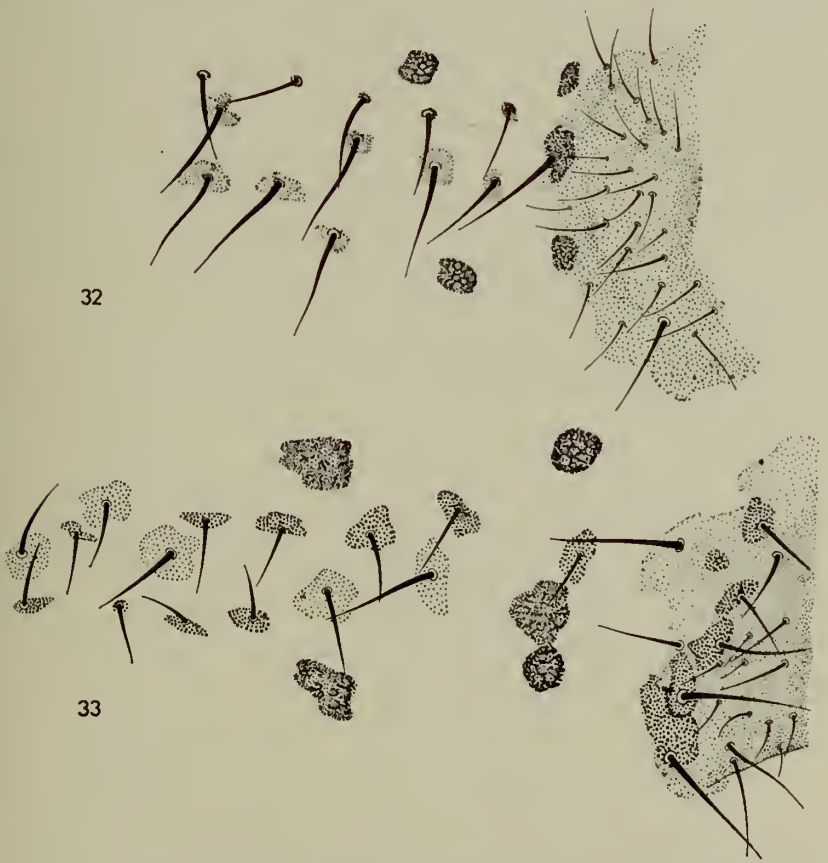
Cinara pinea (Mordwilko)

(Text-figs 32–33)

[? *Aphis pini* L., 1758 : 453 partim.]
? *Lachnus pineti* Hartig, 1839 : 645.
[? *Aphis pilosa* Zetterstedt, 1840 : 311 (see Wahlgren, 1939 : 2–3).]
[*Aphis pini* L., Walker, 1848 : 96–98.]
[*Aphis laricis* Walker, 1848 : 102–103 partim, the alatae and perhaps var. 3 (see Doncaster, 1961 : 93).]
[*Lachnus pineti* (F.) Koch, 1855 : 230–232; Cholodkovsky, 1892 : 74.]
[*Lachnus pini* (L.); Buckton, 1881 : 50–51; Weed, 1890 : 118.]
Lachnus pineus Mordwilko, 1895*a* : 75, 76, 77, 80, 82, 94, 100. [Types unknown. Without locality, presumably Poland.] 1895*b* : 102, 126–130.
[*Lachnus pineti* (Koch); Cholodkovsky, 1898 : 635–638; Schouteden, 1906 : 207; van der Goot, 1915 : 405–408.]
[*Eulachnus pineti* (F.) Del Guercio, 1909 : 334–337.]
[? *Lachnus pini* (L.); Weed, 1890 : 118; Patch, 1912 : 168–169.]
[? *Lachniella pini* (L.) Jackson, 1919 : 165.]
[*Dilachnus taeniatus* (Koch) Swain, 1921 : 228–229. Misidentification.]
[*Panimerus pini* (L.) Theobald, 1929 : 145–147.]
[*Dilachnus pineti* (Koch) Wellenstein, 1930 : 751–752.]
(*Cinara pini* (L.) Hottes & Frison, 1931 : 156; Börner, 1939 : 76; 1952 : 41; Pašek, 1954 : 134–138.]
Cinara pinea (Mordwilko) Börner, 1932 : 569; Mordwilko, 1933 : 159; Braun, 1938 : 478, 492; Knechtel & Manolache, 1943 : 217–219; Palmer, 1952 : 40; Heinze, 1962 : 158–159; Szelegiewicz, 1962 : 85–86; Shaposhnikov, 1964 : 523; Pintera, 1966 : 285–286.
[? *Cinara pinicola* (Kaltenbach); Silvestri, 1934 : 420–421. Misidentification.]
Cinara (*Cinarella*) *pinea* (Mordwilko) Hille Ris Lambers, 1948 : 275.

MATERIAL STUDIED.

ENGLAND: without further data, 2 apterae, 2 alatae, *F. Walker* 659–662. Kent, Hothfield, *Pinus sylvestris*, July 1925, 3 apt.; August 1925, 1 apt. Wye, spruce, 27.v.1913, 7 apt. & 1 alatoid nymph (*F. V. Theobald*). [The correct data for this sample is probably *'Pinus sylvestris*, 5.v.1913': see data for *Cinara costata* from Wye, May 1913.] Brookland, pine, 14.v.1961, 2 apt., 1 al. (*G. M. Day*). Keston, *P. sylvestris*, 11.v.1965, 6 apt.; Hosey Hill, *P. sylvestris*, 6.vii.1964, 2 apt. (*H. C. Dale*). London, Southgate, *P. sylvestris*, 2–5.vi.1847, 3 apt., 1 al.; 25–26.vi.1847, 1 apt., 1 al.; 3.vii.1947, 1 apt., 1 al.; 25.viii.1847, 1 apt., *F. Walker* 668–673. Surrey, *P. sylvestris*, 26.vii.1927, 2 apt.; Woking, *Pinus*, 20.v.1912, 6 apt., many alatoid nymphs; *P. sylvestris*, 19.iv.1913, 3 apt.; 6–20.v.1913, 6 apt., 2 al. & 1 alatoid nymph; 19.vi.1913, 1 apt. (*F. V. Theobald*). Woking, *P. sylvestris*, 15.v.1920, 2 apt., 1 al. (*F. Laing*). Send, *P. sylvestris*, 9.vii.1956, 1 al. (*D. J. Williams*). Wisley Common, ? *Pinus*, 3.v.1965, 2 apt. (*P. S. Broomfield*); pine, 23.v.1965, 1 apt. (*A. Stubbs*). Weybridge, under pine with ant, 1 apt. (*F. V. Theobald*). Kew Gardens, *Picea*



FIGS 32 & 33. *Cinara pinea*, right siphunculus and part of fifth abdominal tergite, × 87. 32, alata. 33, aptera.

excelsa, 18.vi.1920, 1 al. (*F. Laing*); rose bushes, 1–26.vi.1923, 2 al. (*C. L. Withycombe*). Oxshott, pine, 26.vi.1923, 1 al., 13.vi.1926, 2 apt. (*O. W. Richards*). Wisley, R.H.S. gdns, *P. sylvestris*, 14.vi.1957, 1 apt., 4 al. (*J. P. Doncaster*); 22.vi.1961, 1 al. (*P. Becker*). Byfleet, Sheerwater Woods, *P. sylvestris*, 22.iv.1949, 3 fundatrices (*H. L. G. Stroyan* & colln.). Berks, Reading, *P. sylvestris*, 18.vi.1948, 1 apt.; 30.v.1949, 2 apt. (*V.F.E.*). Silwood Park, 40′ suction trap, 4.x.1968, 1 alate male (*Forestry Commission* colln.). Hants, Liphook, *P. sylvestris*, 26.v.1918, 1 al. (*W. C. Crawley*). Alice Holt Lodge, *P. sylvestris*, 24.v.1966, 2 apt., 2 al. (*C. I. Carter*); 14.vi.1967, 2 apt., 2 al. (*H. C. Dale*). New Forest, nr Brook, 10.vii.1962, 4 apt., 1 al. (*J. Grant, G. Day, P. H. Ward*). Herts, Ayot St Lawrence, *Pinus contorta*, 25.v.1946, 4 apt., 2 al. (*J.P.D.*). Whetstone, m/v light, 3–25.vi.1961, 2 al. (*P. H. Ward*). Cambridge, University Botanic gdn, *P. sylvestris*, 10.x–17.xi.1950, 3 oviparae; 21.v.1952, 3 apt.; 20.viii.1951, 1 apt. (*V.F.E.*). Suffolk, Barton Mills, *P. sylvestris*, 24.iii.1948, 6 fundatrices (*H. L. G. Stroyan* & colln.). Walberswick, *P. sylvestris*, 24.viii.1952, 3 apt. (*J.P.D.*). Brooms Barn, nr Bury St Edmunds, 40′ trap, 1.vii.1969 (*N. R. Maslen*, Forestry Commission colln.). Derbys., Wensley, *P. sylvestris*, 28.vi.1946, 7 apt. (*J.P.D.*). Staffs, Cannock, corsican pine, June 1961, 1 apt.; Salop, Whixall Moss, *P. sylvestris*, 28.vi.1969, 1 apt. (*B. R. Pitkin*). Harper Adams, trapped, 3.x.1958, 1 al. (*J.P.D.*). Cumberland, Ennerdale, *P. sylvestris*, 3.vii.1945, 6 apt., 1 al. (*M. S. Hanson*). Eskdale, *P. sylvestris*, 4.vii.1953, 4 apt., 1 al. (*J.P.D.*). Westmorland, Windermere, *P. sylvestris*, 15.vi.1912, 2 apt. (*F.V.T.*). SCOTLAND: *P. sylvestris*, August 1920, 3 apt. (*McDougall & F.V.T.*). Kincardineshire, nr Aberdeen, *P. sylvestris*, July/August 1919, 2 apt., 1 al. (*F. Laing*). Inverness, *P. sylvestris*, 12.viii.1948, 2 apt., 1 al. (*H. S. Hanson*). Perth, Trossachs, juniper, 23.vi.1932, 1 al. (*W. H. T. Tams*). Angus, Glen Doll Lodge, *Pinus* ? *contorta*, 28.vi.1959, 6 apt. (*J. P. Doncaster*). Aberdeenshire, Dinet, *Pinus*, 24.v.1966, 1 apt., 1 al. (*L. A. Mound*). Fife, Dundee, 40′ trap, 17.ix–14.x.1968, 2 alate males (*Forestry Commission* colln.).

CZECHOSLOVAKIA: Jakubov, *Pinus sylvestris*, 26.iv.1952, 2 fundatrices; 18.v.1950, 3 apt. (*V. Pašek*). Kurdejov, *P. sylvestris*, 28.v.1964, 1 al.; Sklene, *P. sylvestris*, 30.v.1964, 1 apt., 1 al.; Kostelni Llota, *P. sylvestris*, 1.vi.1964, 1 apt., 3 al. (*V.F.E.*). GERMANY: Berlin, Hohenstein, *P. sylvestris*, May 1939, 3 apt. ? fundatrices (*W. Storopys*), D.H.R.L. colln. ITALY: Moden, *P. sylvestris*, August 1923, 1 apt. (*C. Menozzi*). NETHERLANDS: Kootẅk, *P. sylvestris*, 16.v.1929, 3 apt., ? fundatrices (*D.H.R.L.* & colln.). Bennekom, *P. sylvestris*, 12.vi.1964, 2 apt., 2 al. (*J.P.D. & D.H.R.L.*). NORWAY: Lapland, Immerfoss, pine, 10.viii.1930, 2 apt. (*Oxford University Lapland Expedition*). POLAND: Gourein, Grodno (Bieloviesch), *P. sylvestris*, 11.vii.1908, 4 apt., 1 intermediate, 2 al. (*A. Mordwilko*). TURKEY: Istanbul, Baticeköy, *P. brutia*, 15.vii.1963, 1 al.; Istanbul, *P. sylvestris*, 6.v.1964, 1 apt., 1 al.; 5.vi.1964, 6 al.; Eskisehir-Fidanlik, *P. nigra*, 8.vi.1964, 2 apt.; Bolu-Aladag, 1360 m, *P. sylvestris*, 3.vii.1964, 5 apt., 2 al. (*H. Çanakçioğlu*). YUGOSLAVIA: Lesce pri Bledu, *P. sylvestris*, 1.viii.1967, 1 apt.; near *P. sylvestris*, 29.vii–1.viii.1967, 4 apt. (*V.F.E.*).

U.S.A.: Iowa, Ames, *Pinus sylvestris*, 11.vi.1924, 3 apt. (*F. C. Hottes*). Utah,

Logan, *P. sylvestris*, 30.ix.1939, 1 ovipara, 1 alate male (*W. P. Nye* coll., G. F. Knowlton leg.); pine, 5.vi.1942, 1 apt. (*E. Stoddard* coll., G.F.K. leg.); *Pinus nigra*, 5.x.1937, 1 apt. viviparae, 2 oviparae, 1 alate male, (*G.F.K. & F.C.H.*); 9.vii.1928, 2 apt. (*G.F.K.*); 5.x.1940, 2 apterae viviparae, 2 oviparae (*W. P. Nye* coll., G.F.K. leg.). Foot of Mount Logan, aspen, 1938, 7 apt. (*R. Nye* coll., G.F.K. leg.). CANADA: Manitoba, Winnepeg, *P. sylvestris*, 15.vi.1964, 2 apt., 2 al. (*A. G. Robinson*). New Brunswick, Frederickton, *P. sylvestris*, 12.vi.1960, 1 al. (*J. B. Adams* coll., M. E. MacGillivray leg.).

HOST-PLANTS. The usual host-plant is *Pinus sylvestris* and occasionally in dry areas, it occurs on *P. nigra*. *Cinara pinea* is also recorded from five other members of the *Lariciones* group, *P. densiflora*, *P. kesiya* (= *khasya*, *insularis*), *P. mugo*, *P. hamata* (= *sosnovskyi*) and *P. thunbergii*. *C. pinea* is also recorded from *Pinus banksiana* (= *divaricata*), *P. contorta* and *P. halepensis* of the *Insignis* group and from *Pinus scopulorum* of the *Australes* group.

DISTRIBUTION. Specimens of *Cinara pinea* have been seen from Czechoslovakia, England, Germany, Italy, Netherlands, Norway, Poland, Scotland, Turkey, Yugoslavia, U.S.A., Iowa, Utah; Canada, Manitoba, New Brunswick and Ontario. *C. pinea* is also recorded from Austria, Belgium, Bulgaria (Tashev, 1961 : 157), Hungary, Portugal (Ilharco, 1968*a* : 119), Roumania, Sweden, Switzerland, U.S.S.R., Estonia, Latvia, Lithuania, Ukraine, Georgia and Eastern Siberia, with queried identity (Grechkin, 1962 : 707), Wales (Thomas & Jacob, 1940 : 139, as *C. pini*) and Minnesota (Oestlund, 1922 : 118). Japanese records are now thought (Inouye, 1970 : 65) to apply to *Cinara piniformosana* (Takahashi).

BIOLOGY. Mr H. L. G. Stroyan has provided adult fundatrices collected between late March and late April in England. Apterae viviparae and a few alatae occur in May, both apterae and alatae viviparae are common in June and apterae viviparae are common but alatae are rarer in July. Apterae viviparae but no alatae have been collected in August. *C. pinea* has apparently not been collected in September in England. Oviparae and alate males occur in October, and one alata vivipara has been trapped in October. *C. pinea* lives on the young twigs and according to Withycombe (1923 : 532) is preyed upon by *Hemerobius nitidulus*.

NOTES. The alatae viviparae of *Cinara pinea* occur in three forms:

Length of first segment of hind tarsus	Total number of secondary rhinaria on both sides of body on antennal segments	
	III	IV + V
300–310μ	15–23	0–3
255–285μ	6–9	4–6
210–240μ	15–27	4–10

This pattern is typical of many aphids (e.g. *Rhopalosiphum maidis*) in which the apterae tend to be larger than the alatae and the alatae have more secondary rhinaria than the apterae. The number of secondary rhinaria on the third antennal segment is correlated both with size and with degree of alatiformity, while the number

of secondary rhinaria on the fourth and fifth antennal segments is correlated almost entirely with degree of alatiformity and is almost independent of size. The fourth and fifth antennal segments of aphids tend to be less affected by body size than is the length of the third antennal segment. The number of secondary rhinaria on the fourth and fifth antennal segments thus tend to be inversely correlated with body size. Similarly apterae with the first segment of the hind tarsi less than 240μ long are usually rather small, body length 3·1–4·5 mm but bear 1–3 secondary rhinaria in total on antennal segments IV + V. Apterae viviparae bearing secondary rhinaria on antennal segments IV or V rarely have the first tarsal segment of the hind leg exceeding 270μ long.

As the fundatrices are similar to the later generations of apterae viviparae the data are pooled in Table 1 (between pp. 172–173). The fundatrices have from 35–49 hairs on the fifth abdominal tergite between the siphunculi where the later generation bear 18–40 hairs.

Dale (1969 : 270) has illustrated the siphuncular aperture of *Cinara pinea*.

Dr D. Hille Ris Lambers informs me that his (1931 : 3) record of *pineti* from *Pinus austriaca* in Italy was based on a member of the *C. pini* group. Blanchard (1926 : 331–332, 1939 : 868–870) records *Cinara pineti* from Argentina but these records could apply to another species, possibly to *C. excelsae* H.R.L.

Cinara pini (L.)

Aphis pini L., 1758 : 453. [No types. SWEDEN: *Pinus sylvestris*.]

Aphis nuda pini DeGeer, 1773 : 27–39. [Types unknown. Locality not stated, presumably SWEDEN.]

Aphis pilosa Zetterstedt, 1840 : 311 partim. [Types. Entomologische Museum, Lund; LAPPLAND] (see Wahlgren, 1939 : 2).

Lachnus pini (L.) Kaltenbach, 1843 : 155–157; Koch, 1855 : 234–236.

Aphis pinicola (Kaltenbach) Walker, 1848 : 98; 1852 : 955–956 partim, nec Kaltenbach, 1843.

? *Lachnus pini* (Kaltenbach); Mordwilko, 1895*a* : 98; 1895*b* : 98–99.

[? *Lachnus taeniatus* (Koch) Mordwilko, 1895*b* : 100, 124–126, partim (see Szelegiewicz, 1962 : 2, footnote). Misidentification.]

? *Lachniella picta* Del Guercio, 1909 : 293–294. [Types unknown. ITALY: Monte Boni, *Pinus sylvestris*, 27.v.1905, aptera vivipara.]

? *Eulachnus abameleki* Del Guercio, 1909 : 316, 329–331. [Types unknown. Locality not stated, presumably ITALY, at the extremities of the branches of *Pinus sylvestris*.]

? *Eulachnus nudus* (De Geer) Del Guercio, 1909 : 339–341.

[*Panimerus pinihabitans* (Mordwilko) Theobald, 1929 : 132–135 partim. Misidentification.]

[*Cinara pineti* (Fabr.) Hille Ris Lambers, 1931 : 3. Misidentification.]

Cinara pini (L.) Börner, 1932 : 569; Braun, 1938 : 479–480; 491–492; Hille Ris Lambers, 1948 : 274–275; Szelegiewicz, 1962 : 86; Shaposhnikov, 1964 : 523; Pintera, 1966 : 296–299.

? *Cinara guadarramae* Mimeur, 1936 : 33–36. [Types, Institut Pasteur. SPAIN: Sierra de Guadarrama, 1,400 m, *Pinus sylvestris*, 10.ix.1935, apterae & alatae viviparae.]

? *Cinaria montanicola* Börner, 1939 : 76. [Types. Deutsches entomologisches Institut. Central & South GERMANY, *Pinus montana*]; 1952 : 43.

? *Cinaria setosa* Börner, 1950 : 2–3. [Types. Deutsches entomologisches Institut, AUSTRIA: *Pinus montana*.]

Cinaria longirostris Börner, 1950 : 3. [Types. Deutsches Entomologisches Institut, AUSTRIA: *Pinus sylvestris*.]

Cinaria polyseta Pašek, 1951 m.s. (see Pintera, 1966 : 296).
[*Cinaria nuda* (Mordwilko) Börner, 1952 : 42–43; Pašek, 1954 : 143–147, 149; Heinze, 1962 : 166. Misidentification.]
[? *Cinaropsis pilicornis* (Hartig); Gomez-Menor, 1962 : 382–386. Misidentification.]

MATERIAL STUDIED.

ENGLAND: Sussex, on *Pinus sylvestris*, Storrington, 17.v.1928, 1 aptera, 4 alatae & nymphs (*E. King*); Forest Row, on young growth, 22.vi.1964, 4 apt., (*E. J. Gatt*). London, Southgate, *P. sylvestris*, 26.vii.1848, 3 apt., 1 parasitized alata; 4.viii.1847, 7 apt., 2 al.; 19.x.1847, apterae viviparae & oviparae (*F. Walker*) 679–683. Surrey, Alice Holt, *P. sylvestris*, old wood, 4.vii.1961, 7 apt., 2 al. (*C. I. Carver & V.F.E.*). Hants, New Forest, near Lyndhurst, pine, August 1922, 2 al. (*F. Laing*). Cambridge, University botanic gdn, *P. sylvestris*, 14.xi.1950, 1 ovipara (*V.F.E.*).

CZECHOSLOVAKIA: Bianska Stiavnika, *P. sylvestris*, 10.v.1950, 1 fundatrix; 9.v.1949, 4 fundatrices; *Pinus montana*, 9.vi.1952, 1 apt.; *P. montana* var. *pumilio*, 17.vi.1952, 2 apt.; Gelnica, *P. sylvestris*, 7.vi.1952, 8 fundatrices, 5 in D.H.R.L. colln. Malacky, *P. sylvestris*, 18.v.1950, 2 al. & nymphs. Zarnovica, *P. sylvestris*, 15.ix.1952, 2 apt. (*V. Pašek*). Bzendec, 29.v.1964, 1 al. (*V.F.E.*). FRANCE: Colbach, *P. sylvestris*, 5.v.1965, 1 fundatrix, Laurent (*D. Hille Ris Lambers* colln.). NETHERLANDS: Bennekom, *P. sylvestris*, 14.v.1947, 4 fundatrices; 30.ix.1946, 2 oviparae, 3 apterous males (*D. Hille Ris Lambers*); 12.vi.1954, 5 apt., 4 al. (*D.H.R.L. & J. P. Doncaster*). NORWAY: Espeland, Fana, trapped, 28.vi.1954, 2 al. (*H. Tambs-Lyche*). RUSSIA: Petrograd, *P. sylvestris*, 2 apt. & nymph (*A. Mordwilko*). TURKEY: Bolu Aladag, 1360 m, *P. Sylvestris*, 3.vii.1964, 13 apt., 1 al. (*H. Çanakçioğlu*).

HOST-PLANTS. The usual host-plant is *Pinus sylvestris* and there are also records from *P. mugo* including its subspecies *P. m. mughus* and *P. m. pumilio* and from *P. nigra* (= *austriaca*) including *P. n. maritima* (= *calabrica, laricio*) of the *Laricione*s group. There are also records from *P. banksiana* (= *divaricata*), *P. halepensis* and *P. montana* of the *Insignes* group, from *Pinus ponderosa* and the subspecies *P. p. scopulorum* of the *Australes* group and from *P. cembra*.

DISTRIBUTION. *Cinara pini* has been seen from Czechoslovakia, England, France, Netherlands, Norway, Russia (Leningrad) and Turkey and has also been recorded from Austria, Germany, Italy, Poland, Scotland, Sweden, Ukraine, Latvia and Yugoslavia. There are also a number of records from North America but as far as known these apply to *Cinara pinea*. No authentic Scottish specimens have been seen although *C. pini* may well occur in Scotland.

BIOLOGY. English apterae and alatae viviparae have been collected in May, July and August and oviparae in November. Dr D. Hille Ris Lambers has provided Dutch and French fundatrices collected in May and Dutch oviparae and apterous males collected in late September. Pintera (1966 : 298) comments that 'alatae viviparous females may occur in the course of the whole vegetative period'. In July *Cinara pini* lives on the underside of the old branches and according to Pintera (1966 : 297–298) it lives on the young shoots in the spring. Wood-Baker (1951 :

271) records *C. pini* feeding around the edge of a resinous scar in Northern Italy, behaviour reminiscent of Tissot & Pepper's (1967 : 1–10) records of associations of some North American *Cinara* species with Pine Rust lesions. The relationship with ants has been discussed by Kloft (1960 : 48–49) and Börner & Franz (1956 : 306) and the honeydew has been studied by Zoebelein (1956 : 374).

Notes. The name *Aphis pini* has been applied to two different species of *Cinara*: to that here called *Cinara pini* (L.) and to *C. pinea* (Mdw.). Hottes (1930 : 186–187), Hille Ris Lambers (1948 : 274–275) and Stroyan (1955 : 332–333) have summarized the arguments. The name *C. pini* is used here in the sense of *Aphis nuda pini* De Geer but Mordwilko's *Cinara nuda* is *C. escherichi* Börner, which Shaposhnikov (1964 : 523) calls *C. nuda* (Mordwilko). According to specimens from Leningrad in the BMNH collection, Mordwilko also determined specimens of *C. pini* as *nuda*.

Cinara pini is a member of a taxonomically difficult group of species. Summer apterae of *C. pini* have 3–8 hairs on the fifth abdominal tergite but fundatrices have 22–36 hairs on the fifth tergite between the siphunculi. Large specimens in the spring have 6–8 accessory hairs on the fourth rostral segment while the usually smaller summer apterae viviparae bear 8–10 accessory hairs on the fourth rostral segments. Specimens from *Pinus sylvestris* have the fourth rostral segment 140–180μ long but specimens from *P. montana* have the fourth rostral segment 175–210μ long and probably belong to a distinct (sub-) species, *C. montanicola* Börner, which may be a synonym of *C. guadarramae* Mimeur. *Cinara setosa* Börner may be based on fundatrices of this subspecies.

The summer dwarfs of *Cinara pini* are similar to *C. palaestinensis* Hille Ris Lambers, which has even smaller siphuncular cones and usually bears relatively longer hairs on the third abdominal tergite and hind tibiae, and lives on *Pinus brutia* in the Mediterranean region.

Cinara canatra Hottes & Bradley from *Pinus banksiana* in North America is similar to *C. pini* except that the dorsum of *C. canatra* is pigmented and the processus terminalis often bears 5 or 6 sub-apical setae as in *C. escherichi*. *Cinara brevispinosa* Gillette & Palmer from *Pinus contorta* in North America resembles *C. pini* but the longest hairs on the eighth abdominal tergite of *C. brevispinosa* are only 35–50μ long (55–160μ in *C. pini*) and the ultimate rostral segment bears only 4 or 5 accessory hairs. *Cinara taedae* Tissot from *Pinus rigida* in North America is similar to *C. pini* but apterae of *C. taedae* of body length 2·1–2·7 mm have the fourth rostral segment 200–220μ long (150–180μ in *pini*) and the longest hairs on the eighth abdominal tergite are 50–65μ long and only about twice as long as the 25–35μ long hairs on the third abdominal tergite (in *C. pini*, 55–160μ on the eighth abdominal tergite and 15–33μ on the third abdominal tergite). *Cinara pinata* Hottes from *Pinus edulis* and *C. thatcheri* Knowlton & Smith from *P. ponderosa* in North America also resemble *C. pini* but their fourth rostral segments bear about 22–24 accessory hairs (6–10 in *pini*).

Cinara pinihabitans (Mordwilko)

? *Aphis pilosa* Zetterstedt, 1840 : 311 partim. [Types, Entomologische Museum, Lund. Lappland, see Wahlgren, 1939 : 2–3.]

[*Aphis pinicola* (Kaltenbach) Walker, 1852 : 955–956 partim. Misidentification.]
Lachnus pinihabitans Mordwilko, 1895*a* : 75, 79, 94, 98. [Types, Polish Academy of Sciences. POLAND: Otwock near Warsaw]; 1895*b* : 97–98, 118–119; Cholodkovsky, 1898 : 638–640; 1902 : 7.
[? *Lachnus taeniatus* Koch; Schouteden, 1906 : 207. Misidentification.]
Lachniella pinihabitans (Mordwilko) Jackson, 1919 : 165.
Dilachnus pinihabitans (Mordwilko) Swain, 1921 : 227–228.
Panimerus pinihabitans (Mordwilko) Theobald, 1929 : 132–135 partim, only the Southgate, 1847 and Scottish, 1917, records; the others are based on specimens of *Cinara pilicornis* and *C. costata*.
Cinara pinihabitans (Mordwilko) Börner, 1932 : 569 partim; Braun, 1938 : 479; Szelegiewicz, 1962*a* : 87; 1962*c* : 245–249; Pintera, 1966 : 301–302; Ilharco, 1968*a* : 119.
Cinaria pinihabitans (Mordwilko) Börner, 1950 : 2.
[*Cinaria taeniata* (Koch) Börner, 1952 : 42; Pašek, 1954 : 151–153; Heinze, 1962 : 166; Gomez-Menor, 1962 : 373–376. Misidentification.]

MATERIAL STUDIED.

ENGLAND: London, Southgate, *Pinus sylvestris*, 4.vi.1847, 2 alatae and nymphs, *F. Walker*, 678. Kent, Wye, 15.vii.1969, 1 al. (*N. R. Maslen*) Forestry Commission colln. Herts, Harpenden, trap F2, 17.vi.1944, 1 al. (*J. P. Doncaster*). Whetstone, light trap, 12.v.1959, 1 al. (*P. H. Ward*). Gloucs., Sodley Ponds, *Castanea sativa*, 2 al., 13.vi.1959 (*R. S. George*). Hants, Liphook, *P. sylvestris*, 26.v.1918, 1 al. (*W. C. Crawley*). Alice Holt, suction trap, 6.vi.1969, 4 al.; 29.vi.1969, 1 al. (*N. R. Maslen*), Forestry Commission colln. SCOTLAND: Morayshire, Rothes, *Pinus sylvestris*, 28.ix.1917, 2 larvae (*D. J. Jackson*). Fife, Dundee, 40′ trap, 27.vi.1968, 1 al., Forestry Commission colln.

FINLAND: Aland, Lemland, *Pinus sylvestris*, 17.vi.1966, 2 apterae (*F. Ossiannilsson*). GERMANY: Serbst, *P. sylvestris*, 26.x.1942, 1 ovipara, 1 alate male (*K. Heinze*). SWEDEN: Uppsala, Björklinge, *P. sylvestris*, 31.vii.1963, 1 apt., 1 al. (*F. Ossiannilsson*).

HOST-PLANTS. *Cinara pinihabitans* has only been seen from *Pinus sylvestris* but there are also records from *Pinus mugo* subsp. *mughus*.

DISTRIBUTION. Specimens have been seen from England, Finland, Germany, Scotland and Sweden and are also recorded from Austria, Czechoslovakia, Ireland, Poland, Portugal, U.S.S.R., Ukraine (Mamontova, 1964 : 54) and Latvia.

BIOLOGY. Alatae occur in traps in May and the first half of June in England but English apterae have not been seen, perhaps they occur high up the tree. The males are described as alate but little else is known about the biology.

NOTES. *Cinara pinihabitans* has been cited as the type-species of *Neodimosis* Toth, 1935, since it was the only species included. *Neodimosis* is probably a *lapsus* for *Neochmosis* and it is not certain which species Toth studied. The name *Cinara taeniata* (Koch) has been used for several different species including *C. pinihabitans*. Braun (1938 : 479) probably had a mixture of species under both *C. pinihabitans* and *C. taeniata*. Theobald's (1929 : 133–135) *pinihabitans* consisted mostly of *C. pilicornis* and *C. costata*. According to Heinze (1962 : 166) *C. longirostris* Börner is similar to, if not identical with, *C. pinihabitans*. *Cinara abamaleki* (Del Guercio) appears to be an Italian member of this group and could be an older name for *C. maghrebica* Mimeur.

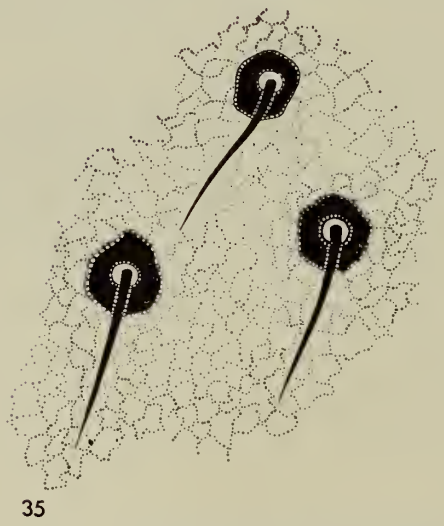
Cinara schimitscheki Börner

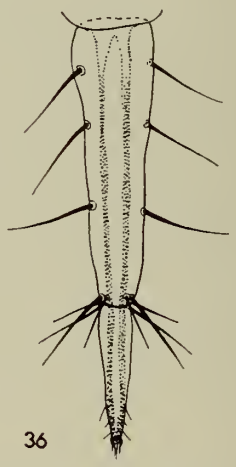
(Text-figs 34–36)

Cinara schimitscheki Börner, 1940 : 1. [Types, Deutsches Entomologisches Institut. CENTRAL EUROPE, ends of twigs of *Pinus austriaca*]; 1952 : 41; Pašek, 1954 : 173–175; Stroyan, 1957 : 348; Heinze, 1962 : 158; Shaposhnikov, 1964 : 523; Pintera, 1966 : 287–288.

Cinara kosarowi Tashev, 1962 : 207–210. [Types, University of Sofia. BULGARIA: *Pinus leucodermis*, 9.viii.1960.]

Cinara (*Cinarella*) *schimitscheki* Börner; Çanakçioğlu, 1966 : 139.





FIGS 34–36. *Cinara schimitscheki*, aptera vivipara. 34, part of right side of fifth abdominal tergite, × 87. 35, enlargement of part of 34, × 450. 36, fourth and fifth rostral segments.

MATERIAL STUDIED.

ENGLAND: Surrey, Kew Gardens, *Pinus nigra*, 31.v.1968, 2 apterae; 30.vi.1969, 2 apt. (*V.F.E.*). Cambridge, University botanic gdn, *Pinus nigra* var. *calabrica*, 9.x.1950, 1 apt. (*H. L. G. Stroyan* & colln.).

BULGARIA: Rodopy, *Pinus* sp. (*nigra*), 31.v.1959, 2 alatae (*R. Bielawski*, H. Szelegiewicz colln. 1176). CZECHOSLOVAKIA: Bianska Stiavnika, *Pinus nigra*, 7.vii.1952, 1 apt. (*V. Pašek*). TURKEY: Eskisehir, Fdanlik, *Pinus nigra*, 8.vi.1964, 2 apt., 1 al. (*H. Çanakçioğlu*).

HOST-PLANTS. *Cinara schimitscheki* has been seen from *Pinus nigra* (= *austriaca*), from its variety *P. n. maritima* (= *calabrica*, *laricio*), is also recorded from the varieties *P. n. caramatica* (= *pallasiana*), *P. n. leucodermis* (as *Cinara kosarowi*) and from *Pinus mugo* subsp. *mughus*.

DISTRIBUTION. *Cinara schimitscheki* has been seen from Bulgaria, Czechoslovakia, England, Turkey and is also recorded from Austria, Germany, Hungary and the U.S.S.R., Crimea.

BIOLOGY. In May and June *Cinara schimitscheki* lives on the young shoots of *Pinus nigra* but according to Pašek (1954) teste Pintera (1966 : 288) it lives under the bark of the older branches later in the year.

NOTES. So few samples are known that it is difficult to evaluate the thickened hairs by which *Cinara kosarowi* was differentiated from *schimitscheki*.

Cinara stroyani (Pašek) stat. n.

[*Lachnus piceicolus* Cholodkovsky; Schouteden, 1906 : 207; van der Goot, 1915 : 402–403. Misidentification.]
[*Dilachnus piceicolus* (Cholodkovsky) Wellenstein, 1930 : 748, 751. Misidentification.]
[*Cinara piceicola* (Cholodkovsky) Börner, 1932 : 480, 491; Braun, 1938 : 480, 491; Hottes, 1955 : 76–77; Stroyan, 1964 : 30–31; Pintera, 1966 : 302–304. Misidentification.]
Cinaropsis drastichi Pašek, 1951 m.s. [see Pintera, 1966 : 3026].
Cinaropsis taxicola Pašek, 1951 m.s. [see Pintera, 1966 : 302].
Cinaropsis minor Pašek, 1951 m.s. [see Pintera, 1966 : 302].
[*Cinaropsis cistata* (Buckton) Börner, 1952 : 43; Heinze, 1964 : 171. Misidentification.]
[*Cinaria* (*Cinaropsis*) *cistata* (Buckton) Pašek, 1954 : 202–207. Misidentification.]
Cinaropsis cistata var. *stroyani* Pašek, 1954 : 207. [Types, Slovak Academy of Science, Bratislava. NETHERLANDS, leg. H. L. G. Stroyan.]
[*Cinara cistata* (Buckton) Ossiannilsson, 1955 : 378; Szelegiewicz, 1962 : 81; Shaposhnikov, 1964 : 522. Misidentification.]

MATERIAL STUDIED.

ENGLAND: Kent, Bromley, *Picea abies*, 5.vii.1965, 1 alata (*H. C. Dale*). Surrey, Kew Gardens, *Picea obovata*, 16.vi.1961, 1 al. (*V.F.E.*).

CZECHOSLOVAKIA: Westerheim, *Picea*, 14.vi.1932, 1 aptera, 1 alata (*D. Aubertin*). Banska Stiatnika, *P. excelsa*, 7.v.1949, 2 fundatrices; 17–23.vi.1952, 5 apt.; Gelnica, *P. excelsa*, 6.v.1952, 5 fundatrices, 2 in D. Hille Ris Lambers colln.; 26.vi.1952, 1 apt., 1 al.; Polana Mount., *P. excelsa*, 9.vii.1951, 2 apt.; Zarnovica, *P. excelsa*, 15.ix.1952, 1 ovipara (*V. Pašek*). Praha—kosire, *P. abies*, 4.vi.1952, 2 apt. (*A.*

Pintera). GERMANY: Tschdf, *P. excelsa*, 29.vii.1944, 1 apt. (*K. Heinze*). Unteres Weldental-schwaiswalt, *P. excelsa*, 15.vi.1944, 1 apt., 1 al. (*K. Heinze*). NETHERLANDS: Bennekom, *Picea*, 21.vi.1949, 4 al. (*D. Hille Ris Lambers & H. L. G. Stroyan* & colln.). POLAND: Bydgoszcz-Jacheice, *P. excelsa*, 4.viii.1956, 1 imm. apt., 1 alatoid nymph (*H. Szelegiewicz*). SWEDEN: Brunnby, Küllen, *P. abies*, 25.viii.1964, 3 apt. (*F. Ossiannilsson* & colln.).

HOST-PLANTS. *Cinara stroyani* has been seen from *Picea abies* (= *excelsa*, *rubra* A. Dietr. nec Du Roi) and is recorded from *P. pungens*, which also belongs to the *Eupicea* group.

DISTRIBUTION. *Cinara stroyani* has been seen from Czechoslovakia, England, Germany, Netherlands, Poland and is also recorded from Austria, Bulgaria, Norway (Stenseth & Bakke, 1968 : 238), Sweden, U.S.S.R., Estonia, Latvia (Zirnits, 1927 : 251), Ukraine.

BIOLOGY. In Czechoslovakia, according to Pintera (1966 : 302–304) the fundatrices of *C. stroyani* occur on the two year old shoots on the shady side of spruce trees and are attended by ants. Alatae occur in large numbers in May in the second and third generations and fly to the current years' shoots to deposit their young. As the summer progresses the colonies move to the older branches near the trunk but have not yet been discovered on the roots. According to Börner & Franz (1956 : 307) *C. stroyani* is mostly on the roots in summer. Oviparae are recorded from July onwards. Saemann (1966 : 380) and Kloft (1960 : 49) have also written on the biology and Zoebelein (1956 : 380) has studied the honeydew.

NOTES. Records of *Cinara piceicola* between 1915 and 1966 mostly apply to *C. stroyani* but Inouye (1938 : 80) had *C. horii* Inouye, 1956. Palmer's (1952 : 39–40) description of metatypes of *C. piceicola* suggest that it is a synonym of *C. pilicornis*. Continental authors suspecting this synonymy used the name *cistata* Buckton for the species. Buckton's specimen is *Cinara costata* from Walker's collection and had been correctly determined by Walker, but the '*o*' in *costata* was not closed and Buckton misread the name as *cistata*.

According to Pintera (1964 : 304, 306) *C. stroyani* is very common in Central and Northern Europe. It is not common in England and this, together with the difficulty in separating *stroyani* from *pilicornis*, may indicate either an ecological difference between the two species or possibly that they are only forms of the same species.

Cinara tujafilina (Del Guercio)

(Text-figs 39–41)

Lachniella tujafilina Del Guercio, 1909 : 288, 311–312. [Types unknown. ITALY: nr Firenze, *Thuja*, 15.vi.1905, aptera.]

Lachnus thujafilinus (Del Guercio) Davidson, 1914 : 127.

Lachniella thujafolia Theobald, 1914 : 335–336. ['Paratypes' in BMNH with data as given in the original description, SOUTH AFRICA: Transvaal, Ondersteport & Pretoria, *Thuja orientalis*, April & August, 1913, apterae viviparae. The specimen labelled 'type' in

Theobald's collection is an alata vivipara, a form not mentioned in the original description, collected from the Orange Free State, 27.viii.1914, a locality not mentioned in the original description.]

Lachnus thujafolia (Theobald) Takahashi, 1921 : 81.

Lachnus biotae van der Goot, 1917 : 161–163. [Types unknown. JAVA: Buitenzorg, 250 m, *Biota orientalis*, December, 1914, apterae & alatae viviparae.]

Lachnus tujafilinus (Del Guercio) Swain, 1919 : 50; Zimmerman, 1948 : 63–64.

Dilachnus thujafolia (Theobald) Hall, 1926 : 3; Okamoto & Takahashi, 1927 : 144.

Dilachnus callitris Froggatt, 1927 : 56–58. [Types unknown. AUSTRALIA: New South Wales, *Callitris*, 1921 & 1925.]

[? *Dilachnus juniperi* (F.); Nevsky, 1929 : 350–351. Misidentification.]

Cinara thujafoliae (Theobald) Takahashi, 1931 : 24; Mimeur, 1934 : 1.

Dilachnus tujafilinus (Del Guercio) Smith, 1932 : 86.

Panimerus thujafoliae (Theobald) Lepiney & Mimeur, 1932 : 128.

Cinara tujafilina (Del Guercio) Börner, 1932 : 570; Boudreaux, 1948 : 98; Smith, Martorell & Escolar, 1963 : 52–53.

Cinara winokae Hottes, 1934 : 1–2. [Type, USNM; U.S.A., Louisiana, Arbor Vitae, 31.xii.1931, alata vivipara.]

Neochmosis tujafilina (Del Guercio) Hille Ris Lambers, 1935 : 63.

[*Cinara juniperi* (De Geer); Blanchard, 1939 : 866–868; Waterston, 1949 : 7; ? Dzhibladze, 1958 : 293 partim. Misidentification.]

Cupressobium tujafilinum (Del Guercio) Börner, 1952 : 44–45; Heinze, 1962 : 176.

Cupressobium thujaphilinum (Del Guercio) Börner & Heinze, 1957 : 57.

Cinara (*Cupressobium*) *tujafilina* (Del Guercio) Eastop, 1958 : 92.

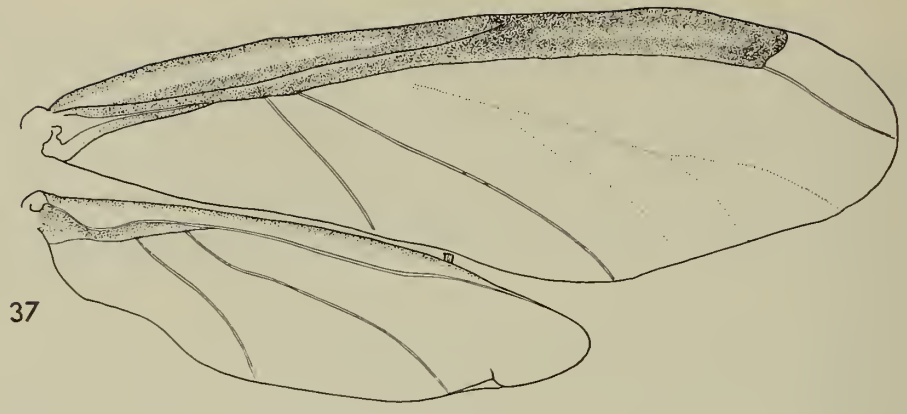
Cupressobium tujafilina (Del Guercio) Gomez-Menor, 1962 : 393–397.

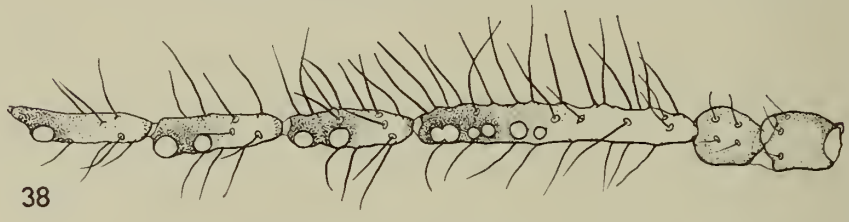
? *Cupressobium mediterraneum* Narzikulov, 1963 : 113–117. [Type, Pavlovsky Institute of Zoology & Parasitology. U.S.S.R., Tadzhikistan, Dushanbe, 29.v.1958, M.N.N.]

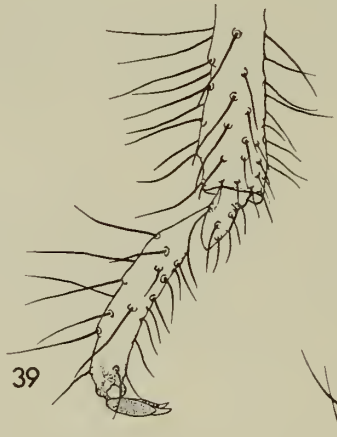
MATERIAL STUDIED.

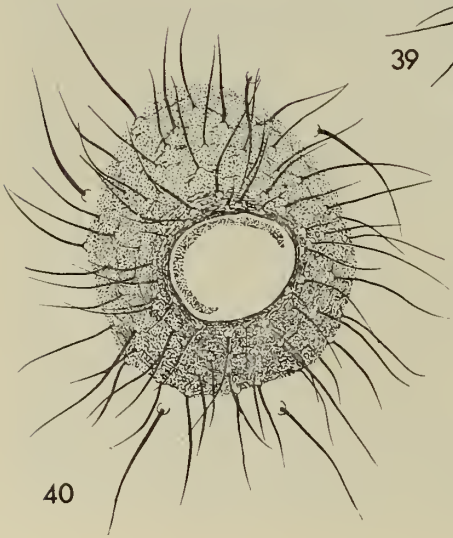
ENGLAND: Surrey, Wimbledon, Thuja, 5.vi.1935, 2 apterae (*C. T. Gimmingham*); Wallington, cypress, June 1965, 28 apt. (*Public Health Dept.*). Essex, Woodford, fir, 5.vi.1944, 4 apt. Berks, Reading, *Chamaecyparis lawsoniana*, 9.v.1948, 5 apt.; *Cupressus* sp., 3.vi.1950, 11 apt. (*V.F.E.*). Hants, Alice Holt, suction trap, 1.vii.1969, 1 alata (*N. R. Maslen*), Forestry Commission colln. Cambridge University Botanic gdn, *Thuja orientalis* var. *elegantissima*, 9.v.1952, 2 apt.; *Thuja* sp., 15.vii.1951, 8 apt. (*V.F.E.*).

EGYPT: Cairo, *Thuja orientalis*, February 1918, 3 apt. (*A. Alfieri*). Giza, *Thuja*, 12.iii.1924, 2 apt., 1 al., 2 alatoid nymphs; Gezireh, *Thuja*, 6.iv.1924, 6 apt., 3 al. (*W. J. Hall*). GERMANY: Elsheim, Friedhof, *Biota orientalis*, 5.ix.1930, 2 apt. (*C. Börner*), K. Heinze leg. IRAQ: Kirur, *Thuja*, 16.iii.1968, 12 apt., 2 al. (*H. E. Knopf*). ITALY: Rome, *Juniperus communis*, 25.iii.1960, 7 apt. (*F. Silvestri*), E. Tremblay leg. (2 in Inst. Ent. Agr., Portici colln.) JAPAN: *Thuja orientalis*, 3 apt. (*R. Takahashi*), ex Theobald colln. MOROCCO: Casablanca, *Thuja occidentalis*, May 1929, 16 apt.; Rabat, *Biota occidentalis*, July 1929, 1 apt., 1 al. [Bouhelier, see Mimeur, 1933 : 1], F. V. Theobald colln. NETHERLANDS: Wageningen arboretum, *Thuja occidentalis ohlendorffi*, 19.vi.1954, 1 apt. (*D. Hille Ris Lambers & J. P. Doncaster*). PALESTINE: Jerusalem, *Thuja orientalis*, 26.v.1946, 3 apt. (*E. Swirski*). Without locality, *Thuja*, 20.ii.1938, 2 apt. (*S. Dauderari*). TURKEY: Istanbul, Bahceköy, 110 m, *T. orientalis*, 5.vi.1964, 21 apt., 1 al. (*H. Çanakçioğlu*).









FIGS 37–41. *Cinara tujafilina*, alata vivipara. 37, wings, × 27. 38, antenna, × 100. 39, hind tarsus, × 100. 40 & 41, siphuncular cone, dorsal and lateral views, × 240.

ERITREA: Asmara, *Thuja orientalis*, 15.viii.1948, 3 apt., 2 al. (*G. de Lotto*). MALAWI: Mt Mlanje, 6000', *Widdringtonia whytei*, 28.vii.1956, 6 apt., 2 al. (*A. McCrae*); June 1958, 2 apt. (*G. W. Hearn*). RHODESIA: Salisbury, *Callitris robusta*, 19.vi.1915, 1 al., 28.ii.1957, 2 immature (*Dept. Agric.*); *Thuja* sp., 11.v.1928, 4 immature; 21.vi.1928, 3 apt. (*W. J. Hall*). *Thuja orientalis*, June 1930, 1 apt.; *T. orientalis*, on roots with ants, 22.v.1965, 1 apt., 8 immature (*Dept. Agric.*). SOUTH AFRICA: Transvaal, Onderstepoort, *T. orientalis*, 6.iv.1913, 1 apt., many immature including 1 alatoid nymph, on 4 slides, paratypes of *thujafolia* Theobald. Pretoria, *T. orientalis*, 1.viii.1913, 4 apt., many immature (*J. Bedford*), paratypes of *thujafolia*, mounted on 7 slides. Orange Free State, Petrusburg, *Thuja*, 27.viii.1914, 1 al., labelled 'type' of *thujafolia* but the alata was not described in the original description, nor is Orange Free State given as a locality. Ladybrand, *Thuja*, 12.viii.1914, 3 apt.; Blomfontain, *Cupressus*, 30.viii.1917, 2 alatoid nymphs, F. V. Theobald colln. Harrismith, 1–20.iii.1927, 2 al. (*R. E. Turner*).

NEPAL: Kathmandu, conifer, 14.xii.1960, 2 apt. (*K. C. Sharma*).

AUSTRALIA: New South Wales, Dubbo, *Callitris endlichi*, 12.x.1959, 3 apt. (*K. M. Moore*). Desert cypress, 24.ix.1921, 2 apt., 2 al. (*W. W. Froggatt*), presumably part of the series from which *callitris* Froggatt was described. Matong State Forest, *Callitris glauca*, 17.xii.1956, 11 apt., 2 in N.S.W. Forest Dept. colln. Buckinbong S.F., *C. glauca*, 20.xii.1956, 4 apt., 3 in N.S.W. Forest Dept. colln. Pennant Hills, *C. rhomboidea*, 31.vii.1958, 10 apt., 1 al.; Stahom S.F., 30.vii.1959, 2 apt., 6 al. (*K. M. Moore*). A.C.T., Canberra, *Chamaecyparis lawsoniana*, 6.ix.1959, 1 apt.; *Libocedrus decurrens*, 3.ix.1959, 2 apt. (*V.F.E.*). Tasmania, Coles Bay, *Callitris tasmanica*, 26.v.1952, 2 apt. (*K. A. Pickett*). Victoria, Colstream, 9.ix.1949, 6 apt. (*Mrs Lithgow*). Melbourne, *Thuja orientalis*, 29.v.1959, 7 apt., 1 alatoid nymph; 23.vi.1959, 8 apt., 2 alatoid nymphs; 3–10.vii.1959, 20 apt., 27 al.; *Thuja occidentalis*, 30.vi.1959, 1 apt.; *T. occidentalis* cultivar 'Rheingold', 30.vi.1959, 21 apt. (*V.F.E.*).

BERMUDA: Paget E., *Juniperus bermudiana*, 15.v.1943, 17 apt. (*J. M. Waterston*). U.S.A.: California, Riverside, *Thuja occidentalis*, 8.ix.1916, 1 apt., 1 al. (*A. F. Swain*). Texas, Crystal Springs, *Thuja*, 22.ii.1936, 4 apt., 1 alatoid nymph (*M. J. James* coll.), G. F. Knowlton leg. Utah, St George, *Thuja*, 22.iii.1946, 14 apt., 3 al.; evergreen tree, 24.iii.1951 (*M. S. Burmingham* coll.); Green River, arbor vitae, 16.v.1958, 24 apt.; Murra, *Juniperus* sp., 27.x.1964, 1 apt., 4 larvae (*G. F. Knowlton*).

HOST-PLANTS. The usual host-plant is *Thuja* (*Biota*) *orientalis* but specimens have also been seen from the following Cupressaceae, *Thuja occidentalis*, *Callitris columellaris* (= *glauca*), *C. endlichi*, *C. priessii* (= *robusta*), *C. rhomboidea*, *C. tasmanica*, *Chamaecyparis lawsoniana*, *Juniperus virginiana*, *Libocedrus decurrens* and *Widdringtonia whytei*.

DISTRIBUTION. *Cinara tujafilina* has been seen from Egypt, England, Germany, Iraq, Japan, Morocco, Netherlands, Palestine, Turkey, Eritrea, Malawi, Rhodesia, South Africa, Nepal, Australia, Bermuda, U.S.A., California, Texas and Utah. *C. tujafilina* was originally described from Italy and is also recorded from Bulgaria

(Tashev, 1964 : 173), Portugal (Ilharco, 1968*a* : 64), Spain, Mozambique (Ilharco, 1970 : 2–3), Puerto Rico, Florida (Tissot, 1939 : 42), Louisiana and Missouri (Kring, 1955 : 64).

Biology. The distribution of *Cinara tujafilina* is much wider in the warmer and drier parts of the world than most other species of *Cinara*. Large numbers of apterae occur on the undersides of the branches near the trunk in June and smaller numbers of apterae in May and July. Alatae have not been collected in Britain. According to Bray (1953 : 103–107) *C. tujafilina* occurs on the roots in the summer. According to Waterston (1949) it is attended by the ant *Pheidole megacephala*. Tissot (1939 : 42), Waterston (1949 : 7) and Weigel & Baumhofer (1948 : 19–20) record the damage caused by this aphid and Gomez-Menor (1963 : 397) says that *C. tujafilina* is primarily controlled by *Chilocorus bipustulus* in Spain. Lepiney & Mimeur (1932 : 28) record *Scymnus subvillosus* as a predator in Morocco. Froggatt (1923 : 163) gives an account of an outbreak of the 'Cypress Pine Aphis' in New South Wales in 1921 but did not formally describe the aphid and apply a latin binomen until 1927.

Notes. *Cinara tujafilina* is more common on *Thuja orientalis* and *Cinara cupressi* is more common on *Thuja occidentalis* but Blanchard's description of *Cinara juniperi* from *Thuja occidentalis* in Argentina seems to apply neither to *juniperi* nor to *cupressi* but to *C. tujafilina*. Tashev (1944 : 173) on the other hand may have had *Cinara cupressi*.

A single aptera (body length 2·5 mm) and 4 larvae collected on *Juniperus excelsa*, Turkey, Bardur Sarnic, 1300 m, 3.vii.1970 by Dr H. Çanakçioğlu are similar to *C. tujafilina* except that the longest hairs on the hind tibiae are only 128μ long. The longest hairs on the hind tibiae of *C. tujafilina* are 140–240μ long and are only less than 155μ in specimens less than 1·8 mm long. The Turkish specimens probably represent a hot weather form of *C. tujafilina* but may be a distinct (sub-) species, possibly *C. mediterraneum* (Narzikulov).

HOST PLANTS OF THE BRITISH SPECIES OF *CINARA*

PINACEAE

Abies spp.
Cinara abieticola, C. pectinatae
Cedrus spp.
Cinara abieticola
Larix and Pseudolarix spp.
Cinara boerneri, C. kochiana, C. laricis
Picea (Eupicea) abies (= excelsa) glauca (= alba, canadensis), orientalis, pungens
Cinara bogdanowi, C. costata, C. piceae, C. pilicornis, C. stroyani
Picea (Cascita) engelmanii, jezoensis, likiangensis, sitchensis
Cinara costata, C. piceae, C. pilicornis
Picea (Omorika) breweriana, omorika, spinulosa
Cinara costata, C. piceae
Pinus (Insignes) banksiana (= divaricata), contorta, halepensis, montana

Cinara pinea, C. pini

Pinus (Lariciones) mugo including mughus

Cinara pinea, C. pini, C. pinihabitans

Pinus (Lariciones) nigra (= austriaca) including caramatica (= pallasiana), leucodermis, maritima (= calabrica, laricio)

Cinara acutirostris, C. brauni, C. schimitscheki and occasionally *C. pinea*

Pinus (Lariciones) sylvestris including hamata (= sosnovskyi)

Cinara escherichi, C. pinea, C. pini, C. pinihabitans

Pinus (Australes) ponderosa including scopulorum

Cinara pinea, C. pini

CUPRESSACEAE

Callitris, Chamaecyparis, Libocedrus spp.

Cinara tujafilina

Cupressus arizonica, torulosa

Cinara fresai

Cupressus goveniana

Cinara cupressi

Cupressus macrocarpus

Cinara cupressi, C. fresai

Juniperus bermudiana

Cinara tujafilina

Juniperus chinensis, communis, oxycanus, oxycedrus

Cinara juniperi

Juniperus horizontalis, sabina

Cinara fresai

Juniperus virginiana

Cinara cupressi

Thuja occidentalis

Cinara cupressi and rarely *C. tujafilina*

Thuja (Biota) orientalis

Cinara tujafilina

ACKNOWLEDGEMENTS

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Table 1

Biometric data for the apterae viviparae of the British species of *Cinara*

	Host plant	Number of specimens	Body length mm	Diameter of siphuncular cone	Mesosternal tubercle	Chitinized rim of primary rhinaria	Sclerotes on abdominal tergites 2–5	Length in μ of antennal segments				Length of rostral segments in μ		First segment of hind tarsus in μ	
								III	IV	V	VI	IV	V	basal diameter	dorsal length
piceae	*Picea*	19	3·2–6·7	170–630	absent	present	absent	530–1110	180–370	300–550	120–200 + 40–81	300–370	120–145	45–80	51–92
fundatrix	,,	10	5·4–6·7	340–510	,,	,,	,,	820–920	230–310	360–420	170–210 + 22–51	300–350	120–150	70–80	62–77
kochiana	*Larix*	12	5·7–6·1	410–530	,,	,,	very small	720–980	290–460	390–530	130–200 + 56–88	320–420	120–150	53–66	62–94
boerneri	,,	54	2·4–4·1	170–300	,,	absent	very small	500–720	230–320	280–390	130–190 + 26–52	150–210	85–105	42–53	79–112
laricis	,,	29	2·5–5·1	230–630	low	present	large	410–670	140–300	190–370	100–140 + 22–35	160–210	80–100	34–60	57–96
acutirostris	*Pinus nigra*	17	2·8–4·1	390–710	present	present	very small	530–650	180–300	230–330	130–170 + 34–49	210–250	110–130	40–46	44–53
fundatrix	,, ,,	2	3·3–3·5	290–370		,,	,, ,,	440–470	150–200	190–230	140–160 + 20–27	200–210	105–115	37–43	40–48
pini	*P. sylvestris*	24	2·5–4·4	160–700	present	,,	,, ,,	400–700	140–260	190–270	100–180 + 25–52	140–220	70–120	31–46	38–57
fundatrix	,, ,,	14	3·2–4·0	310–620	absent	,,	,, ,,	460–660	180–240	210–280	100–160 + 27–46	150–180	70–100	36–59	40–70
pinihabitans	,, ,,	3	3·7–4·2	170–460	present	,,	present	620–650	250–330	250–280	120–160 + 31–37	150–160	85–90	41–44	45–67
escherichi	,, ,,	9	3·2–4·3	370–640	,,	,,	small	560–710	220–320	260–360	130–190 + 42–61	210–230	96–106	37–48	49–72
fundatrix	,, ,,	3	4·0–4·2	300–720	small–absent	,,	,,	620–670	240–260	250–270	170–180 + 35–45	200–210	100–105	53–60	58–64
brauni	*P. nigra*	30	2·5–3·8	fused	absent	present V broken	black patch	530–700	190–310	250–360	170–220 + 53–95	250–330	120–150	33–48	89–115
pinea	*P. sylvestris*	73	3·1–5·1	270–700	absent	present	large	500–740	220–360	280–400	140–230 + 43–71	210–290	110–170	47–65	137–220
schimitscheki	*P. nigra*	9	3·3–5·1	440–720	,,	,,	very small	630–860	270–350	300–380	120–200 + 52–70	290–360	130–165	45–60	86–111
pectinatae	*Abies*	32	2·8–5·0	180–300	,,	,,	present	330–550	130–210	160–240	140–200 + 40–63	210–270	80–105	43–58	121–155
costata	*Picea*	30	2·7–3·8	330–530	,,	,,	very small	330–470	120–200	180–260	150–210 + 19–35	190–260	105–125	35–44	23–35
pilicornis	,,	43	2·1–4·7	130–390	,,	,,	,, ,,	250–530	120–210	150–280	110–180 + 25–45	190–250	100–130	31–53	27–53
stroyani	,,	16	2·1–4·2	170–580	,,	,,	,, ,,	340–590	130–240	170–300	120–180 + 19–44	210–270	85–125	35–57	33–60
fundatrix	,,	7	3·5–4·6	200–420	,,	,,	,, ,,	420–530	130–180	130–180	130–160 + 17–30	210–250	100–115	38–49	35–54
bogdanowi	,,	30	2·4–5·0	240–870	,,	,,	absent	350–740	170–350	240–390	120–200 + 30–60	240–320	110–140	35–70	35–76
fundatrix	,,	2	3·4–3·8	420–560	,,	,,	,,	380–390	150–170	180–190	130–160 + 14–22	250–260	100–105	40–50	40–45
abieticola	*Abies*	22	3·8–7·8	490–990	,,	absent from V	very small	580–1100	280–590	330–630	230–290 + 44–90	270–360	120–150	53–81	20–46
juniperi	*Juniperus*	67	2·4–3·1	360–600	,,	absent	very small	250–370	95–180	160–280	150–230 + 40–70	120–170	60–90	31–58	13–28
fresai	*Juniperus Cupressus*	46	2·2–4·2	200–610	,,	,,	very small or absent	300–580	140–240	160–270	140–220 + 40–70	160–240	75–120	35–44	20–34
cupressi	*Cupressus Thuja*	88	1·8–3·2	200–570	,,	,,	very small or absent	240–450	100–200	130–210	130–160 + 25–46	130–180	70–100	35–44	19–35
tujafilina	*Thuja Callitris*	33	1·7–3·5	130–300	,,	,,	very small or absent	230–330	85–150	120–170	110–170 + 18–35	140–180	70–90	30–45	19–31

TABLE 1 (*contd.*)

	Hind tarsus segment		Hind tibia length mm	Length of longest hair on				Number of hairs on second antennal segment	Number of hairs on sixth antennal segment		accessory hairs on ultimate rostral segment	sub-genital plate	abdominal tergites		Number of secondary rhinaria on antennal segments		
	1 ventral length	2 length		Third antennal segment	Hind tibia	abdominal tergites 3	abdominal tergites 8		Base	sub-apical processus terminalis			5	8	III	IV	VI
piceae	130–210	360–470	2·3–5·1	27–80	44–90	5–26	45–130	9–16	9–17	6–11	12–17	48–76	6–17	9–17	0(–1)	0–1(–2)	0–2
fundatrix	170–200	390–430	3·9–4·3	40–70	55–90	9–18	70–150	5–11	11–16	6–8	8–12	47–120	6–12	7–13	0	0	0
kochiana	170–210	370–450	2·9–4·6	60–70	55–90	11–25	90–130	21–32	15–21	6–9	22–34	33–55	18–40	41–64	1–7	1–4	1–3
boerneri	150–210	360–510	2·0–3·0	24–70	50–70	14–33	60–100	7–13	6–11	4	5–7	19–56	16–36	18–31	0	0–1(–3)	(0–)1(–2)
laricis	110–180	270–390	1·5–2·9	40–80	65–125	35–120	90–180	5–9	4–7	(3–)4	5–7	18–29	20–42	13–23	0(–1)	0–1	1
acutirostris	100–140	240–310	2·4–3·2	70–95	90–120	40–65	110–180	6–8	9–12	4	6–9	18–37	4–7	12–18	0–2	0–1(–2)	(0–)1(–2)
fundatrix	100–130	240–250	1·9–2·1	75–90	105–125	85–90	140–160	6–8	7–9	4	6	26–34	18	17–21	0	0	1
pini	90–130	210–280	1·6–2·5	25–80	40–95	15–35	55–160	5–10	8–16	(3)–4	6–10	9–36	3–8	7–18	0–3	0–2	1(–2)
fundatrix	110–130	270–310	2·1–2·6	65–90	90–105	15–40	130–140	5–6	9–12	4	7	32–50	23–30	18–25	0–1	0–1	1–2
pinihabitans	120–150	260–320	2·5–2·7	110–150	170–190	140–180	140–160	7–8	8–10	4	4–6	28	40–50	20–24	0–2	1	1
escherichi	120–150	270–320	2·6–3·2	40–70	70–90	13–17	90–120	9–13	11–16	6–7	8–11	39–58	(5–)6	14–23	0–3	0–2	1(–3)
fundatrix	150–160	340–360	2·9–3·0	60–70	80–100	19–30	120–140	9–13	19–12	5–7	6–7	52–56	13–18	34–49	0(–1)	0–3	1(–2)
brauni	150–210	320–430	1·8–2·7	75–120	90–140	110–190	120–180	8–11	9–16	5–8	5–8	32–69	21–36	10–15	0–2	0–3	(0–)1(–2)
pinea	220–330	350–530	1·8–3·4	90–210	120–230	95–210	120–230	5–9	2–8	(3–)4(–5)	4–6	22–52	18–49	13–26	0(–4)	0(–2)	0(–2)
schimitscheki	170–220	320–380	2·2–3·0	70–120	110–150	45–100	95–130	9–13	6–9	(3–)4	6	50–58	26–65	27–60	0	0	0
pectinatae	190–260	360–450	1·2–2·0	45–110	110–190	30–130	130–200	5–8	5–8	(3–)4	5–8	30–50	36–56	23–38	0	0	0–1(–2)
costata	80–120	250–330	1·1–1·8	140–170	170–250	110–150	120–190	11–15	10–17	3–4	4(–5)	22–42	54–92	26–52	0	0–2	1–2
pilicornis	90–150	300–520	0·9–2·2	90–150	130–220	100–160	130–180	9–18	6–14	(3–)4	4–7	13–38	30–90	20–77	0–1	0–2	1(–2)
stroyani	110–160	340–450	1·6–2·4	60–90	60–105	60–80	100–150	14–22	11–18	4(–5)	6–9	32–65	40–100	14–35	(0–)1(–3)	1–3	1(–2)
fundatrix	110–150	320–400	1·6–2·3	70–100	100–135	90–105	120–150	9–16	6–10	(3–)4	6–8	43–56	65–95	23–40	0(–1)	(0–)1	1
bogdanowi	120–180	250–380	1·5–2·8	80–150	80–170	90–150	120–160	12–26	11–20	4(–5)	9–13	18–33	40–90	19–35	0–2	1–4	1(–2)
fundatrix	110–120	230–270	1·5–1·9	80–110	130–150	100–120	130–150	15–19	7–10	4	9	27	80–95	23–40	0–1	0–3	1
abieticola	130–180	380–500	3·4–5·4	190–300	150–330	160–270	190–360	12–24	9–14	3–4	7–13	30–50	70–85	29–43	0	1–4	1–2(–3)
juniperi	70–100	250–350	0·9–1·5	140–210	180–240	140–210	150–230	6–13	7–13	(2–)3(–4)	(3–)4(–5)	19–27	28–55	18–29	0	1–2	(0–)1(–2)
fresai	80–120	260–350	1·2–2·2	190–250	190–280	180–230	190–260	8–12	7–12	3	5–7	28–44	45–65	17–27	0	1–3	1(–2)
cupressi	80–120	240–310	1·0–1·7	150–220	180–240	120–200	170–220	6–13	4–7	(2–)3	2–4	22–30	30–50	16–31	0	(0–)1(–2)	(0–)1
tujafilina	60–100	200–280	0·8–1·6	110–170	140–240	100–180	120–100	7–12	8–14	3	5–8	19–33	50–70	19–26	0	(0–)1(–2)	1

Table 2

Biometric data for the alatae viviparae of the British species of *Cinara*

	Number of specimens	Body length	Diameter of siphuncular cone	Chitinised rim of primary rhinaria	Scleroites on abdominal tergites 2–5	Length of antennal segments				Length of rostral segments		Hind tarsus		Length of hind tibia in mm
						III	IV	V	VI	4	5	first segment: dorsal length	first segment: ventral length	length of second segment
piceae	39	4·6–6·4	410–950	evident	small or absent	650–1230	290–420	460–580	190–210 + 50–70	300–370	130–150	65–100	170–220	450–520	4·3–6·3
kochiana	2	4·8–5·5	420–440	,,	,, ,, ,,	820–870	400–460	500–520	150–180 + 65–90	330–360	140–150	75–85	170–200	410–440	3·5–3·9
boerneri	9	3·4–4·6	250–450	present	small	550–750	250–330	340–420	150–190 + 25–40	160–190	90–105	90–120	180–220	440–510	2·6–3·2
laricis	35	3·1–4·8	300–650	,,	evident	500–750	220–340	280–420	110–160 + 25–45	160–200	85–110	60–90	130–180	320–400	2·2–3·0
acutirostris	10	3·2–4·1	360–530	evident	absent	560–650	210–290	260–320	120–160 + 35–50	190–230	110–135	35–55	100–130	250–310	2·5–3·2
pini	19	2·2–4·0	240–430	,,	,,	440–700	180–300	220–330	110–160 + 35–60	140–180	70–100	35–60	90–125	220–300	1·8–2·9
pinihabitans	17	3·0–4·4	240–370	,,	absent or v. small	550–750	200–340	250–370	120–160 + 35–50	130–170	80–100	45–75	110–160	260–330	2·3–2·9
escherichi	6	3·4–4·4	300–490	,,	,, ,, ,, ,,	610–700	250–320	320–360	140–170 + 40–55	200–220	95–110	45–75	130–155	300–360	2·9–3·2
brauni	7	2·8–3·7	440–620	,,	absent	520–650	220–290	270–320	170–220 + 60–90	260–300	130–145	80–110	160–190	350–410	2·1–2·5
pinea	40	3·3–5·3	370–730	,,	large	540–750	230–350	300–420	150–230 + 40–85	210–270	115–150	130–240	210–330	340–520	2·2–3·2
schimitscheki	4	3·4–4·6	450–580	narrow	small	590–730	270–310	290–340	150–190 + 40–70	310–330	120–170	70–120	160–200	320–360	2·4–3·1
pectinatae	5	3·3–5·0	150–400	present	small to large	300–550	160–200	180–230	160–200 + 29–50	190–250	90–100	150–180	190–270	380–450	1·4–2·2
costata	18	3·0–4·4	320–600	,,	v. small to absent	400–660	170–240	210–260	160–220 + 14–40	190–250	95–125	25–50	100–120	300–370	2·0–2·6
pilicornis	65	2·6–4·4	170–370	,,	absent	350–560	130–240	160–280	110–190 + 25–55	160–250	95–140	25–55	95–155	350–540	1·5–2·2
stroyani	2	2·0–3·8	130–390	evident	,,	360–480	140–200	160–250	120–170 + 25–35	180–240	95–120	35–55	100–125	320–340	1·4–2·1
bogdanowi	18	3·2–4·7	500–670	,,	,,	540–850	240–430	210–460	150–210 + 25–70	230–290	105–135	50–85	125–180	310–340	2·4–3·5
abieticola	23	5·1–7·5	500–990	absent	v. small	800–1150	380–620	380–650	250–320 + 45–75	290–370	130–165	30–55	140–200	420–570	4·3–6·7
juniperi	13	2·6–3·1	330–460	,,	,, ,,	360–460	130–210	190–270	180–230 + 40–75	130–160	60–95	20–35	85–110	320–370	1·6–1·9
fresai	34	2·7–4·2	250–600	,,	,, ,,	390–560	160–280	200–290	150–240 + 38–75	140–210	85–115	15–40	90–110	280–390	1·6–2·6
cupressi	14	2·2–3·5	300–450	,,	v. small or absent	350–550	160–220	180–230	140–190 + 30–50	130–170	75–100	20–35	80–110	280–350	1·4–2·2
tujafilina	22	2·5–4·1	170–380	,,	,, ,, ,, ,,	310–410	140–200	160–190	130–180 + 14–30	130–180	65–100	25–35	90–110	240–340	1·6–2·1

TABLE 2 (*contd.*)

	Length of longest hairs on				Number of hairs on antennal segments		sub-apical processus terminalis	accessory hairs on rostral segment	Number of hairs on						Other characters
	third antennal segment	hind tibia	Abdominal tergites						Sub-genital plate	Abdominal tergites		Secondary rhinaria on antennal segments			
			3	8	II	VI Base		4		5	8	III	IV	V	
piceae	40–65	45–75	35–80	80–140	11–18	12–20	7–11	10–17	60–110	6–14	12–20	5–15	1–3	1–2	Proximal 2/3 of hind femur pale
kochiana	55–70	45–75	30–60	80–100	21–32	15–22	5–8	24–34	33–55	18–40	43–61	11–14	2–5	2–4	
boerneri	25–40	50–80	20–40	75–100	8–13	7–9	4(–5)	4–8	35–48	19–24	16–32	7–13	1–4	1–3	Hind femur pale near base only
laricis	50–80	120–150	70–110	130–190	5–9	4–7	(3–)4	5–8	12–29	16–30	14–25	3–11	0–4	(0–)1(–2)	Hind tibiae with a pale area near base
acutirostris	70–100	110–130	65–100	120–160	6–8	9–13	4	6–8	24–38	5–6	10–17	1–6	1–4	1	,, ,, ,, ,, ,, ,, ,, ,,
pini	50–90	75–140	15–75	90–150	6–9	8–14	(3–)4(–5)	6–10	20–42	4–7	9–19	5–10	1–3	1–2	,, ,, ,, ,, ,, ,, ,, ,,
pinihabitans	120–160	170–210	120–200	150–200	6–9	7–11	(3–)4	4–5	17–29	18–38	11–22	1–8	1–4	1–2	,, ,, ,, ,, ,, ,, ,, ,,
escherichi	55–75	75–95	30–55	85–120	7–13	12–16	6–7	8–11	39–58	4–6	17–22	4–10	2–4	1–3	,, ,, ,, ,, ,, ,, ,, ,,
brauni	80–110	140–160	120–180	130–200	7–12	11–14	6–7	4–7	30–62	16–26	12–16	9–17	2–4	1–3	,, ,, ,, ,, ,, ,, ,, ,,
pineo	120–170	190–270	150–240	170–250	3–10	3–9	2–5	4–6	29–49	18–39	17–27	1–18	0–5	0–3	,, ,, ,, ,, ,, ,, ,, ,,
schimitscheki	120–150	150–170	70–110	110–150	7–13	7–8	(3–)4	6–7	50–70	50–58	35–43	0–9	0–1	1	Hind tibiae black
pectinatae	75–110	190–240	85–150	170–210	6–8	5–7	3–4	7–8	40–70	37–50	24–50	0–9	0–6	0–1	Hind tibiae dark near apex
costata	150–210	190–290	130–160	150–210	11–17	12–20	3–4	4–6	29–43	32–68	26–42	1–3	1–2	0–2	Fore-wing maculate near apex
pilicornis	80–160	180–270	105–160	125–220	8–20	6–13	3–4	4–6	18–42	24–49	21–53	1–8	0–3	1–2	Hind tibiae dark near apex
stroyani	70–105	95–180	55–110	100–200	9–18	9–17	4–5	5–8	22–37	24–49	16–32	6–9	1–3	1–2	Hind tibiae dark or with a very small dusky area near the base
bogdanowi	140–190	160–240	130–190	150–210	14–24	11–19	4	8–15	22–36	30–55	24–42	1–8	1–3	1	Hind tibia with pale area near base
abieticola	220–320	220–380	160–320	250–320	18–25	10–14	(3–)4	8–13	32–45	50–70	29–42	7–15	2–5	0–3	Hind tibiae black or with a small brown area near the base
juniperi	160–200	250–320	160–240	220–260	7–11	6–12	3(–4)	4	23–34	25–30	19–24	4–8	1–4	0–2	Hind tibiae black
fresai	190–250	280–360	140–210	190–260	10–14	8–14	(2–)3(–4)	5–8	26–40	60–70	16–27	6–11	1–4	1–2	,, ,, ,,
cupressi	160–220	230–350	120–200	160–260	7–10	5–6(–7)	(2–)3	2–5	22–40	60–70	15–25	3–6	1–3	1–3	Hind tibiae dark at base and apex
tujafilina	120–200	140–310	120–210	130–210	9–11	9–13	3(–4)	4–8	24–36	38–60	17–24	3–8	1–3	1–2	Hind tibiae dark at apex only

TABLE 3

Discriminants for the apterae viviparae of the British species of *Cinara*

	Third antennal segment		Hind tibia: longest hair borne on it	Antennal segments V : VI	Rostral segments 4 : 5	Rostral segment 4: hind tarsal segment 1	Hind tarsal segment 2: rostral segment 4	Hi tar segn 2 :
	diameter of siphuncular cone	longest hair borne on it						
piceae	1·0–3·2	7·5–31	36–84	1·6–2·1	2·2–3·0	1·8–2·5	1·1–1·3	2·2–
fundatrix	1·8–2·4	12–23	57–79	1·6–1·9	2·2–2·9	1·6–2·0	1·1–1·4	2·0–
kochiana	1·6–2·2	8·5–15	38–78	1·7–2·2	2·4–3·0	1·8–2·2	1·0–1·2	2·0–
boerneri	1·8–3·5	7·8–25	32–56	1·4–1·9	1·7–2·3	0·9–1·3	1·8–2·6	2·1–
laricis	0·8–2·1	6·8–13	17–34	1·4–2·5	1·2–2·2	1·0–1·7	1·4–2·1	2·0–
acutirostris	0·8–1·6	6·6–9·3	24–33	1·3–1·8	1·8–2·3	1·6–2·1	1·0–1·4	2·0–
fundatrix	1·2–1·6	5·0–6·0	16–19	1·1–1·4	1·7–1·9	1·6–2·0	1·1–1·3	1·9–
pini	0·7–2·5	7·7–15	23–42	1·1–1·9	1·7–2·3	1·3–1·9	1·2–1·7	2·1–
fundatrix	0·9–1·6	6·6–11	22–39	1·2–1·8	1·7–2·2	1·2–1·6	1·5–1·8	1·9–
pinihabitans	1·2–1·6	4·4–6·0	14–16	1·4–1·8	1·7–1·9	1·0–1·3	1·7–2·3	2·1–
escherichi	1·1–1·7	9·5–15	30–46	1·4–1·8	2·0–2·4	1·1–1·7	1·2–1·5	2·0–
fundatrix	0·9–1·5	9·5–11	31–34	1·1–1·3	2·0–2·1	1·3–1·5	1·6–1·8	2·2–
brauni	0·8–1·2	4·5–9·5	16–25	0·9–1·3	1·8–2·5	1·5–2·0	1·0–1·5	1·9–
pinea	0·8–2·1	3·2–6·5	12–20	1·1–1·7	1·6–2·2	0·8–1·2	1·4–2·0	1·4–
schimitscheki	1·0–1·5	5·9–12	15–27	1·3–1·5	2·1–2·4	1·4–1·8	0·9–1·2	1·6–
pectinatae	1·4–2·2	3·4–11	7–18	0·7–1·0	2·4–2·9	1·0–1·2	1·5–1·9	1·7–
costata	0·7–1·2	2·0–2·8	6–9	0·8–1·2	1·8–2·4	1·7–2·5	1·2–1·6	2·6–
pilicornis	1·2–2·2	2·3–4·5	7–12	1·0–1·4	1·8–2·1	1·4–2·3	1·5–2·4	2·9–
stroyani	0·6–2·3	4·2–7·5	17–29	1·1–1·4	2·1–2·5	1·5–2·3	1·2–1·9	2·0–
fundatrix	1·2–2·3	4·7–6·7	14–21	0·9–1·4	2·2–2·4	1·7–2·1	1·4–1·6	2·6–
bogdanowi	0·6–1·9	3·2–6·2	14–27	1·0–1·7	1·9–2·6	1·6–2·3	0·9–1·3	1·9–
fundatrix	0·7–0·9	3·6–4·7	11–18	1·0–1·5	2·3–2·6	1·8–2·3	0·9–1·3	2·1–
abieticola	0·9–1·9	2·6–4·4	12–29	1·2–1·8	2·1–2·6	1·8–2·4	1·2–1·5	2·5–
juniperi	0·5–1·1	1·5–2·3	4–8·3	0·7–1·1	1·6–2·1	1·4–2·1	1·8–2·4	3·1–
fresai	0·7–1·7	1·7–2·4	6–9	0·7–1·1	1·6–2·4	1·8–2·2	1·3–1·7	2·6–
cupressi	1·1–1·7	1·6–2·5	5–8	0·7–1·1	1·5–2·1	1·4–1·9	1·5–2·0	2·5–
tujafilina	0·8–1·5	1·6–2·5	5–9	0·8–1·1	1·8–2·2	1·6–2·1	1·4–1·7	2·6–

Table 4

Discriminants for the alatae viviparae of the British species of *Cinara*

	Third antennal segment		Hind tibia: longest hair borne on it	Antennal segments V : VI	Rostral segments 4 : 5	Rostral segment 4: hind tarsal segment 1	Hind tarsal segment 2: rostral segment 4	Hind tarsal segments 2 : 1
	diameter of siphuncular cone	longest hair borne on it						
piceae	1·1–2·1	17–26	65–120	1·8–2·3	2·2–2·8	1·5–1·9	1·3–1·6	2·2–2·7
kochiana	1·9–2·0	11–15	50–75	1·9–2·3	2·3–2·4	1·7–2·0	1·2–1·3	2·1–2·4
boerneri	1·3–2·6	17–25	38–60	1·7–2·1	1·7–2·1	0·8–1·0	2·4–2·8	2·3–2·7
laricis	1·0–1·9	7–12	16–23	1·7–2·7	1·6–2·1	1·0–1·3	1·8–2·4	2·1–2·7
acutirostris	1·1–1·6	6–8·5	20–29	1·4–1·9	1·6–1·8	1·7–2·1	1·1–1·4	2·3–2·6
pini	1·3–2·3	5·5–9	14–25	1·2–1·7	1·6–2·2	1·2–1·6	1·5–1·8	2·2–2·7
pinihabitans	1·8–2·6	3·5–6	12–16	1·5–2·0	1·5–1·9	1·0–1·3	1·7–2·2	2·0–2·4
escherichi	1·3–2·1	8·5–12	32–38	1·5–1·9	2·0–2·2	1·3–1·6	1·4–1·7	2·1–2·6
brauni	1·0–1·3	6·5–8	14–16	1·0–1·2	1·9–2·3	1·5–1·8	1·2–1·5	2·0–2·3
pinea	0·9–1·7	3·5–6	9·5–16	1·1–1·7	1·6–2·1	0·7–1·1	1·5–2·1	1·4–2·0
schimitscheki	1·2–1·5	4–6	15–19	1·2–1·5	1·9–2·6	1·6–2·0	1·0–1·2	1·8–2·0
pectinatae	1·1–2·0	3–6·5	6–12	0·8–1·1	2·1–2·8	0·8–1·1	1·7–2·1	1·7–2·1
costata	0·8–1·5	2·4–3·3	7·5–10	0·9–1·3	1·7–2·2	1·7–2·3	1·3–1·7	2·8–3·5
pilicornis	1·2–2·2	3–5	6·5–11	0·9–1·4	1·6–2·1	1·4–2·0	1·8–2·6	3·2–4·4
stroyani	1·2–2·2	3·7–6·1	9·5–18	1·0–1·3	1·9–2·2	1·6–2·2	1·6–1·9	3·1–3·5
bogdanowi	0·9–1·6	2·9–5·1	11–23	1·5–1·9	1·9–2·6	1·5–1·9	1·1–1·5	2·2–2·7
abieticola	1·1–1·9	2·9–4·5	14–24	1·3–1·8	2·0–2·5	1·6–2·5	1·4–1·6	2·6–3·5
juniperi	0·9–1·2	1·9–2·6	5·7–6·8	0·7–1·1	1·5–2·0	1·4–1·6	2·0–2·8	3·3–4·0
fresai	0·8–1·6	1·8–2·4	5·8–7·7	0·8–1·1	1·6–2·2	1·6–2·1	1·6–2·1	2·9–3·5
cupressi	1·0–1·5	2·1–2·6	5·6–6·8	0·9–1·2	1·5–1·9	1·2–1·7	2·0–2·4	2·8–3·5
tujafilina	1·0–1·9	2·0–2·9	6·3–8·6	0·9–1·1	1·5–2·2	1·2–1·8	1·6–2·2	2·6–3·3

Table 5

Biometric and other data for the sexuales of the British species of *Cinara*

	Available subgeneric name	Condition	Number examined	Males Secondary rhinaria on antennal segments III	IV	V	VI	Pseudosensoria on hind tibiae o oviparae
piceae	*Mecinaria*	unknown		—	—	—	—	absent or inconspicu
kochiana	*Laricaria*	alate	1	90–98	18–20	12–15	0	numerous, inconspicuous
boerneri	*Cinarellia*	,,	15	82–111	19–39	13–20	9–14	numerous
laricis	*Cinaria*	,,	8	60–110	18–31	11–19	6–11	numerous, inconspicuous
acutirostris	*Cinara*	apterous	2	0–2	5–8	2–5	7–8	absent
pini	,,	alate	0	33–37	7–11	2–5	0	inconspicuous
pini subsp. ***montanicola***	,,	apterous	3	3–27	3–8	2–5	0	absent or inconspicu
pinihabitans	,,	alate	1	91–116	20–30	7–8	0	conspicuous
escherichi	,,	? apterous	0	—	—	—	—	unknown
brauni	*Subcinara*	unknown	0	—	—	—	—	,,
pinea	*Cinarella*	alate	3	45–63	11–24	7–10	0	numerous, conspicuo
schimitscheki	,,	unknown	0	—	—	—	—	unknown
pectinatae	*Buchneria*	alate	1	56–68	14–27	12–14	4–5	conspicuous
costata	*Lachniella*	alate	0	38–60	13–25	6–12	0	conspicuous, tibia swollen
pilicornis	*Cinaropsis*	,,	2	45–58	13–18	3–4	0	numerous, conspicuo
stroyani	,,	unknown	0	—	—	—	—	indistinct
bogdanowi	*Pityaria*	alate	1	46–82	12–26	4–15	0	numerous, conspicuo
abieticola	*Dinolachnus*	,,	2	102–130	35–39	14–18	0	,, ,,
juniperi	*Cupressobium*	unknown	0	—	—	—	—	unknown
fresai	,,	,,	0	—	—	—	—	,,
cupressi	,,	alate	3	22–39	8–12	6–7	0	numerous, conspicuo
tujafilina	,,	unknown	0	—	—	—	—	unknown

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